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The Magazine for Business Computing Experts

July 1993

PC Computing

Special Issue!

MOBILE COMPUTING!

99 products that give you desktop power on the road

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•

6 Mighty Subnotebooks

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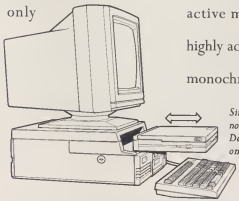
THE COMPAQ LTE LITE. FOR THEIR TIME WORKING. AND

OK, we're not saying you live on three hours of sleep, or that you eat Chinese takeout every night. And even if you do, we're not saying that a COMPAQ LTE Lite 486SL notebook is suddenly going to change all that.



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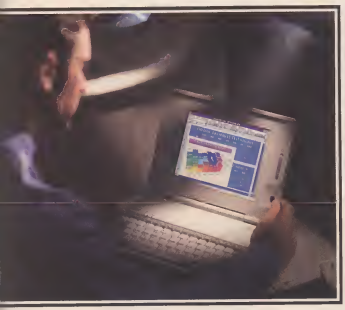
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PC Computing



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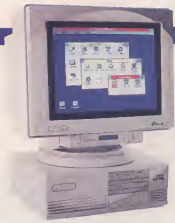
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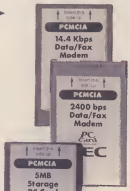
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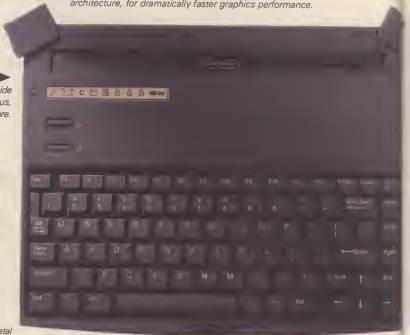
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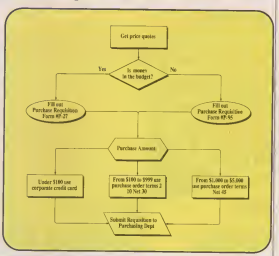
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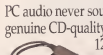
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Circle 211 on reader service card.

*Base SRP.

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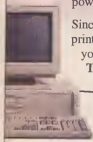
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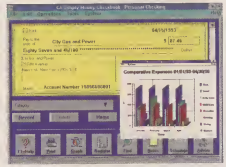
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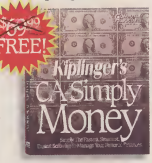


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Comparison based on Kiplinger's CA-Simply Money 1.0 and Intuit Quicken 2.0 for Windows

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PC/Computing's Bill of Rights for The Usability Revolution

HOW FAST CAN YOU TURN A PC PRODUCT INTO PRODUCTIVITY?

The true test of a new piece of hardware or software isn't how many nanoseconds it saves some white-coated lab technician; it's how many hours it saves you each week. At *PC/Computing*, we believe that's the only benchmark that matters. To focus on productivity, we've assembled a team of usability experts, and we've built our own state-of-the-art usability testing lab. Beginning next month, we'll award a Usability Seal of Approval to products that meet or exceed the usability standards you help us define.



By year's end, our usability lab will have completed full-scale reviews of word processors, spreadsheets, database managers, peer-to-peer networks, network laser printers, communications and fax software, presentation graphics software, hard disk utilities, memory managers, sound boards, and much more.

That's not to say we'll ignore other measurements of productivity. We'll continue to measure differences in speed. We'll try out new products on a variety of platforms, because compatibility can still be a nightmare. And you can count on us to keep torture-testing notebook PCs and other hardware products to identify those that last.

But usability testing is what defines the real differences between products these days. That's not just a personal opinion; it's the overwhelming consensus of the business buyers we've surveyed. When you buy a new piece of hardware or software, you expect it to solve problems, not give you more headaches. Believe it or not, you have a few rights.

1. The right to proper packaging When you buy a product, you expect it to fit into your system. It should offer a choice of 3½- or 5¼-inch disks, and CD-ROM availability is becoming a must.

2. The right to hassle-free installation A perfect upgrade would slice its own shrink-wrap, install itself on your system, and have a cup of coffee on your desk in the morning. Here's a more realistic expectation: An installation routine should recommend options but preserve your right to change the source drive and the destination drive and directory. Usable installation routines report their progress as they work and never modify configuration files without permission.

Hardware that requires a free IRQ setting or DMA channel had better be able to spot a conflict on its own. An add-in board that collides with another peripheral and leaves the mess for you to clean up flunks the usability test miserably. In the same spirit, any hardware or software product should compare your system's free resources (hard disk space, memory, processor type, and so on) against its own resource requirements before it starts installing.

3. The right to complete compatibility A new product had better work with all the hardware and software we've accepted as standards, like DOS 5.0 and 6.0, Windows 3.1, Gateway and Compaq PCs, NEC monitors, ATI graphics boards, every HP laser printer in the known universe, Hayes modems, and Logitech mice.

4. The right not to read the manual If you still need the manual after one week with a product, it's either a programming language or a usability dud. In my office, I've surrendered 12 feet of precious shelf space to software and hardware manuals. On most of them, the dust is thick enough to qualify for farm subsidies. When I get stuck onscreen, I expect instant assistance when I press F1. Context-sensitive online help is an absolute must. And since it's cheaper to make a CD-ROM than to duplicate 20 disks, why not put the whole manual online? Just make sure the printed documentation includes step-by-step quick-start instructions, a crystal-clear table of contents, a great index, and the phone number for tech support.

5. The right to an intuitive interface As long as human beings write computer programs, there will be bad user interfaces. True, there are some fundamental differences between DOS and Windows programs, and nobody's created a Windows program with an interface as aggressively unfriendly as, say, DisplayWrite's. But we've seen too many Windows programs that bury their best features under badly organized menus and inscrutable button bars. Usability testing uncovers the trouble spots with amazing accuracy.

6. The right to no-questions-asked support When you buy a product, whoever sells it has the responsibility to help you make it work. The vendor can reasonably ask you to register the product's serial number. The vendor can start charging for phone calls after a reasonable period of time—a year, perhaps. But the vendor should never stop answering the phone or, worse, leave you on hold for hours. And you should never have to pay when you call to report a bug or defect.

It's time to demand more than impressive benchmark scores.

PC/Computing's usability tests require scorecards that run ten pages or more. A usability test takes a week or more to complete. When you see the *PC/Computing* Usability Seal of Approval, you'll know the product that bears it will install without hassle, will be compatible with your software and hardware, will be intuitive enough that you almost never need the manual, and will come with accessible, affordable tech support. After all, aren't these your rights? Tell us what you expect from a product bearing our Usability Seal of Approval. Send your thoughts to Usability Seal, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404.

PHOTOGRAPH BY RICHARD MORGENSTEIN

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HAVE SOME QUESTIONS ABOUT BUYING A COMPUTER? JUST ASK ZEOS!

Q. How can I make sure I'm getting a computer that won't be obsolete next year?



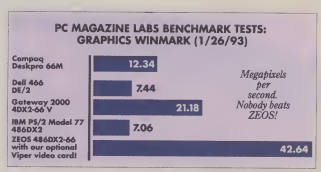
A. Make sure you're getting more than just an OverDrive socket for your CPU. You want a computer that you can *upgrade to Pentium-level technology.* With ZEOS upgradables, you're ready for the future…a Pentium future! And our Zero Insertion Force (ZIF) socket makes upgrading easy.

CPU upgradability is only part of the story. Check out the number of drive bays and open slots on the PC you want to buy. ZEOS gives you *six* bays and eight slots—two of which are local bus!

Q. I want incredible speed. What should I look for?

A. For high-speed video that's upgradable with industry-standard graphic adapters, *you want a system that has VESA-standard local bus slots.* As we mentioned above, ZEOS gives you two of them. Our standard super-fast local bus SVGA card includes Windows acceleration, and if you want the video performance that PC Magazine said "blew all competitors away," choose our optional Viper video card. And, because you're getting the VESA standard, you won't get stuck with some proprietary architecture that's obsolete in 6 months. Demand VESA standard with your system!



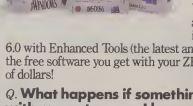




And for data transfer that's over twice as fast, *get local bus IDE.* It's the same fast local bus technology applied to the built-in IDE drive controller. ZEOS gives you performance *up to 225% that of ordinary IDE systems!*

Q. What other things should I look for when I buy a system?

A. Check out the software. Most ZEOS packages come with *everything you need* to get started: your choice between *two* spreadsheet programs (Lotus 1-2-3 for Windows or the exciting new Lotus Improv), a word processing program (Ami Pro) or a presentation program (Freelance Graphics for Windows). That's in addition to Lotus Organizer, Windows, and DOS 6.0 with Enhanced Tools (the latest and greatest!). With all the free software you get with your ZEOS, you save hundreds of dollars!



Q. What happens if something goes wrong with my system—or I have a question?

A. It never fails—the biggest questions come up when you're working late on something important. It's comforting to know that you can call ZEOS technical support, *toll-free, 24 hours a*

day, 365 days a year. And better yet, it won't take six days to get past a busy signal.

Not that you'll probably need to call at all. ZEOS was recently named *PC Magazine Readers' Choice for Service and Reliability.* For both desktops and notebooks. So you can buy with confidence!



Q. What other kinds of after-the-sale support will you give me?

A. You're covered by our One Year Limited Warranty, Express Parts Replacement Policy and a complete ZEOS Customer Satisfaction Package. And if you're not absolutely convinced your new ZEOS PC is everything we say it is and more, you have a full 30 days to return it to us for a complete refund. No questions asked.

Q. All of this must cost a lot...right?

A. No way. Check out our prices. Shop around and compare systems. We think you'll agree: *Feature for feature, no one gives you as much as ZEOS. At any price!*

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Archive 51250A internal tape backup
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Hundreds of other affordable upgrades and options available. Call for details!

Q. So—how do I get a ZEOS system?

A. Just give us a call—toll free! We're open 24 hours a day, 365 days a year. A friendly and knowledgeable ZEOS Systems Consultant will be glad to answer your questions, help you pick a package, or tailor a system to your exact specifications. We know you'll agree: ZEOS is absolutely your best choice. And we don't just say it. We guarantee it!

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486DX-33	1595	2095	2495	2795
486DX2-50	1695	2195	2595	2895
486DX2-66	1795	2295	2695	2995
Intel 486 CPU	■	■	■	■
ZIF upgrade socket	■	■	■	■
MB of RAM expandable to 64MB on motherboard	2	4	8	16
High-speed IDE hard drive (MB)	107	214	340	452
Built-in hard drive cache	32K	128K	128K	256K
Local bus IDE hard drive interface	■	■	■	■
Seek time (ms)	16	16	12	12
1.2MB floppy drive	■	■	■	■
1.44MB floppy drive		■	■	■
ZEOS 14" high-resolution mono VGA monitor	■			
ZEOS 14" high-resolution 1024x768 non-interlaced SVGA monitor		■	■	■
Monitor dot pitch (mm)	.28	.28	.28	.28
1MB high-speed VESA local bus card with Windows accelerator	■	■	■	■
Eight expansion slots including two VESA local bus	■	■	■	■
Two serial ports, one parallel port	■	■	■	■
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Circle 272 on reader service card.

Making the Most of Your Memory

Demystifying the OS/2 masters, reactions to Penn's merry prank, and locker-room lingo

Face-Off Feedback

Many thanks for your article "Face-Off: QEMM-386 vs. 386Max," (April, page 228). Your tips on how to grab more RAM justified the price of this year's subscription. You know how it goes—add new software and start routinely running more programs in Windows, and your operating speed drops to a crawl. Until a few minutes ago, I could make and eat a sandwich in the time it took everything to load. I had been considering adding more memory, upgrading my motherboard, and taking other drastic measures. Then I tried a few of your tips, and performance became acceptable again.

SUSAN PRINCE
ALTA, CALIFORNIA

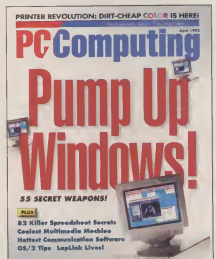
I was extremely pleased to see your review of 386Max and QEMM-386, and I'd like to mention a minor point. A TERSE option is available with 386MAX.SYS, 386LOAD.COM, and 386LOAD.SYS. It causes most of the extraneous messages that appear during boot-up to disappear. 386MAX.SYS still spits out a copyright notice, but that's all. TERSE is undocumented, but it's extremely handy.

ERIK AMICK
VIA PC/CONTACT

Thanks for the tip. To use this option, find each instance of the 386MAX.SYS, 386LOAD.SYS, and 386LOAD.COM filenames in both your CONFIG.SYS and AUTOEXEC.BAT files, and insert the word TERSE after the filename and before any other parameters. As always when modifying system files, use a text-only editor (such as DOS's EDIT), and make a copy of each file before you change anything. —Dylan Tweney

The usually reliable Dan Gookin really missed the mark in your QEMM-386 vs. 386Max face-off. I've used both products on and off for years, and QEMM-386 is hands down the superior product. I admit that 386Max has a much friendlier interface than QEMM-386, but form is less important than substance.

On my Compaq computer, the most free upper memory space that 386Max has ever fetched is 156K. By using QEMM-386's Stealth feature, however,



I have squeezed out 248K. This is significantly more upper memory block (UMB) space for the many device drivers and TSRs that I use—and it keeps my available DOS space at 623.8K.

MIKE SERAFIN
WASHINGTON BORO, PENNSYLVANIA

The Masters' Secrets

I found most of the performance tips in "Techniques of the OS/2 Masters" (April, page 208) to be quite useful. Thank you for your increased coverage of OS/2. I look forward to more of the same in the near future.

DUSTIN CHRISTMANN
VIA PC/CONTACT

I commend you on "Techniques of the OS/2 Masters," and I'm convinced that Ed Bott and John C. Dvorak deserve to be called masters. They seem to have accomplished an impossible feat with their version of OS/2 2.0: In the killer tip on page 210, they recommend disabling the Win-OS/2 clipboard if you don't cut and paste information between Windows and OS/2 apps. To do this, they say to right-click on the Win-OS/2 program object, click on Open, Settings, and click on the Session tab. Then they say to press the Win-OS/2 Settings button, and toggle the WIN_clipboard setting off.

Sounds like a great idea, but my copy of OS/2 2.0 doesn't have the WIN_clipboard setting option.

ALAN LLERA
GREAT FALLS, MONTANA

After reading "Techniques of the OS/2 Masters," I fired up my PC to make use of some of the hints. I was disappointed to discover that I couldn't customize individual DOS sessions with a special version of AUTOEXEC.BAT that was described on page 212. DOS_AUTOEXEC is not included in my selection of DOS Settings. What gives?

MARGARET A.S. HAYES
SCOTTVILLE, MICHIGAN

Oops. Our test machines included a number of different versions of OS/2, among them a late beta copy of OS/2 2.1, which contains the new settings for DOS sessions. IBM had originally

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5-Year Average Annual Growth: 85%
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planned to release Version 2.1 around the time our article appeared but later announced a delay in the ship date. It should be ready around the time you read this. If you're a serious OS/2 user, get the upgrade. It's worth it.

—Ed Bott

Beyond NetWare

Your article "Consultant's Notebook: 10 Expert Tips for Buying the Right Network Server" (April, page 218) is almost totally oriented toward optimizing NetWare. However, NetWare isn't the only game in town. As a consultant, I work with a host of small- to medium-size businesses with networks that range from 2 to more than 50 nodes. For most of my clients, a lower-cost solution like LANtastic provides acceptable performance without the high price tag that Novell has placed on its NOS.

Computer users at small businesses who read your article are likely to think they'll need to implement NetWare—but the majority of them won't.

Also, they'll think they need a much more powerful file server than they actually do. Network purchasers should be willing to pay for a good file server. They should demand quality, workmanship, design, and performance. However, there are ways to get these things without turning to some of the high-dollar alternatives that your article specified.

WILLIAM H. LESHER
DENVER, COLORADO

The Joke's on You—Again

About Penn Jillette's annual aren't-we-cute April Fools' ad for a nonexistent computer (April, page 332): The joke is almost as stale as Penn's humor. Give the column to someone who can relate users' problems humorously without using a hand buzzer or an exploding cigar.

If you can't replace Penn, just sic the Phantom Shopper on him and expose him for what he is.

JAMES B. STONEY
WHITESTONE, NEW YORK

I love Penn. Don't ever let him stop!

LAUREN KING
DENTON, TEXAS

It has come to my attention that Thurman Computers is offering an additional upgrade package for the very successful, top-of-the-line N486/DX50 notebook PC. For an additional $50, you can get a multimedia kit that contains all of the following items:

- A SoundBlaster 2000 32-bit SCSI sound card with one pair of B&W 801 dual mirror-imaged 18-inch Velodyne 400-watt subwoofers
- Two Krell 500-watt Class A monoblock power amps
- A Krell remote-control Class A preamp
- A Snell five-speaker Surround Sound system

THE COMPAQ SYSTEMPRO/XL BEAT
ALL OTHER INDUSTRY-STANDARD SERVERS
IN THE TPC BENCHMARK™ TESTS.

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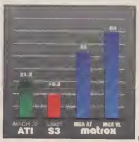
Introducing Matrox MGA...

Harness the Power of 64-Bit Graphics

Photo courtesy of Sigma Design, U.S.A.

Introducing Matrox MGA, the new series of 64-bit graphics accelerators for the PC Power User.

MGA's 64-bit graphics engine surpasses regular 32-bit technology to deliver workstation graphics performance for CAD and Windows professionals. MGA gives you up to 12 times more hardware performance and up to 60 million WinMarks.



In real-life applications, MGA delivers speed with the highest display resolutions, true color, real-time 3D and the best productivity enhancing features.

For Windows users, MGA's Control Panel, lets you easily access features like hardware pan and zoom, virtual desktop, and on-the-fly resolution switching without having to leave your application or restart Windows. MGA displays 1024 x 768 in full 24-bit color and up to 1600 x 1200 in near true color with QCDP, Matrox's exclusive color quality dithering process.



Just a few of the 16.7 million colors to choose from.

Attention CAD users. MGA comes bundled with DynaView, the most powerful interface to AutoCAD and Microstation. In a viewport, you can interactively render 3D models with high-quality Gouraud shading. DynaView gives you the smoothest real-time pan and zoom in the industry.

MGA is the one-card graphics solution for Windows, CAD and Multimedia. MGA's Upgrade Options let you capture broadcast quality video, output graphics to standard video devices or increase your printing speed up to 600%.

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matrox

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*Ziff-Davis WinMark 3.1, 486 DX 2/66, 4Mb memory, 1024 x 768 in 256 colors, 72Hz.

- A commercial-grade THX Lucas Surround Sound processor
- A 12GB Bernoulli storage system
- A calcium-hydride battery capable of 24 hours of charge with a 1½-hour recharge time
- Your choice of a General Dynamics or Link F-15 flight simulator that meets military specifications

Act now; this limited-offer upgrade isn't advertised.

TODD THOMPSON
DARIEN, CONNECTICUT

During the past year, I have enjoyed the excellent articles and reviews in your magazine. Overall, you seem to set high standards for your publication, so I just wrote off Penn Jillette's column on the back page. Occasionally, however, I would read it to see if he had survived the trials and tribulations of puberty. I now realize that he never will.

Your back page leaves a bad aftertaste. I offer Penn the following advice:

1. Oxy 5 will really help with the acne.
2. Your voice should stop its squeaking in a few months.
3. When it's time to lose your virginity, you will know. Don't try to rush it. People grow up at their own pace, so stop worrying so much about it.

STEVEN TUROFF
VIA PC/CONTACT

PCs Don't Get No Respect

I am very upset about Gil Schwartz's column "Journey to the Center of the Box with *PC/Computing*'s Business Wonk" (April, page 92).

There are ways of being funny without destroying perfectly good computer equipment. Mr. Schwartz should read his article in the March issue ("From Clunky Lunch Box to Screaming Workstation: One Wonk's Evolution," page 198) for a refresher on good computer humor.

LUKE SCHARF
VIA PC/CONTACT

Take a Chill Pill

Please get Paul Somerson back under control. April's Dvorak vs. Somerson ("Backing Up Isn't Hard to Do When You Do It the Right Way—Our Way," page 100) sounds more like a conversation in a high school locker room than a debate between two professionals.

Use of terms such as *anal, bejeezus, scarf up, schlepp,* and *wonk* are out of place in a magazine for business computing users. They are especially out of place coming from the editor-in-chief. I hope future debates will stick more to the issue at hand and stray less into the world of *cool* vernacular.

RICHARD PONTO
WAUKESHA, WISCONSIN

Gripes About Gateway

I enjoy your magazine and eagerly wait for it to come in the mail. However, I feel you do your readers a great disservice through your continued reviews and support of Gateway 2000 products.

INFOWORLD MAGAZINE NAMED
THE COMPAQ PROSIGNIA
SYSTEMS PRODUCT OF THE YEAR.

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Get a hold of the best value in LAN power protection

Now just $139!

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Blackouts, brownouts, sags... Your data and hardware are vulnerable to problems that surge suppressors and power directors are just not equipped to handle.

Now there's a complete Uninterruptible Power Supply solution to suit any budget. The Back-UPS™ 250 is reliable protection for LAN nodes, 386SX machines, 286, small PS/2 systems, and internetworking hardware such as routers, bridges, gateways and repeaters.

From the largest server to the smallest router, the Back-UPS Series will increase your productivity by providing a cost-effective solution to power problems. **Call for your free power protection handbook.**



The **Back-UPS 250** offers even more cost-effective protection for LAN nodes (typical runtime for a 386SX system is 10 minutes).

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- ABSOLUTE™ Protection guarantees repair or replacement of equipment (up to $25,000) if damaged by a surge while protected by a properly installed Back-UPS (See warranty for details).
- UL, CSA and Novell approved with a 2 year warranty
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- Ask about PowerChute® UPS monitoring software and Novell compatible UPS monitoring boards
- 230V models available

LAN TIMES READER'S CHOICE 1992 — 1991, 1990

Software Reseller News Editors' Choice

	Model	Application	List	New List
	Back-UPS 250	LAN nodes, 386SX, 286, internet hardware, POS	~~$169~~	$139
	Back-UPS 400	Desktop 386, 486 systems, 286 servers	~~$249~~	$229
	Back-UPS 450	Tower 386, 486 systems, servers	~~$329~~	$279
	Back-UPS 600	Heavily configured systems, CAD/CAM workstations	~~$449~~	$399
NEW!	**Back-UPS 900**	Multiple systems, longer runtime applications		$599
NEW!	**Back-UPS 1250**	Multiple systems, LAN hubs, small minis, telecom equipment		$799

Circle 116 on reader service card.

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When my 1986-vintage PC finally couldn't do the job anymore, I used *PC/Computing* to help me decide what system to purchase next. I wanted to go with Dell, but after pricing identical systems, I found that a Gateway 2000 was $2,000 cheaper. So I placed my order. Although I was told the system would arrive within four weeks, it took more than eight weeks. I have also found that Gateway 2000 doesn't have enough people or enough toll-free phone lines for a company that ships 3,000 systems a day. My calls almost *never* get through (although once you reach the technicians, they're helpful).

There are myriad problems with Gateway 2000, but in short, it is not a company that you should endorse so heartily. Your word is law for many people shopping for a new system. Before others are seduced by Gateway's cheap prices, let me say that you get what you pay for.

ANDREW K. SANDS
CHARLESTON, SOUTH CAROLINA

We sent a copy of Mr. Sands' letter to Gateway 2000. This is the company's response:

Please accept our apologies for the missed ship date. Our representatives quote estimated ship dates and should not be making hard promises. We are currently revising our forecasting procedure to work with our suppliers more efficiently and provide more accurate ship dates.

Gateway 2000 grew very rapidly during the last quarter of 1992, more than we ever imagined. The majority of the problems that you experienced were a result of that growth. We have hired more than 300 people since the first of the year to better serve all of our customers.

All of our new employees must go through an intense training period. Experience will come with time and with constant training. We have also recently upgraded our telephone system. I am sure that all of our customers will notice improvement in all areas of our organization very soon.

—Cathy J. True
Assistant to the President, Gateway 2000

Windows in Excess?

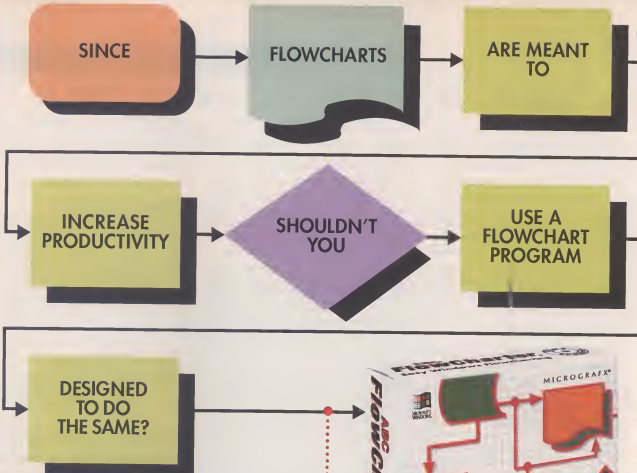
Your Software Saleswire in April (page 86) indicates that four out of ten best-selling business applications, six of ten best-selling personal apps, and five of ten best-selling utilities are DOS software. Having demonstrated that the DOS market is alive—indeed, thriving—and represents a vast market, how do you justify devoting virtually 100 percent of your magazine to Windows? Give the DOS world a break and address your whole audience—including DOS users!

ROBERT D. KURTZ
CLAREMONT, CALIFORNIA

It seems that you cannot be "The Magazine for Business Computing Experts" when you mention Unix only occasional-

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COMPAQ SERVERS OVER EVERY
OTHER BRAND.

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If you want the only program designed specifically to make flowcharting fast and easy, what's the next step? Simply call and find out more about ABC FlowCharter at **1-800-326-3573** or see your local software dealer.

FEATURE	ABC FLOWCHARTER® 2.0	VISIO™ 1.0	HARVARD GRAPHICS® FOR WINDOWS 1.0
Steps necessary to connect 2 shapes	2 clicks & 1 drag	4 clicks & 4 drags	Not available
Adding connect point to a shape	Click on shape picture in dialogue box	Calculate coordinates, enter in spreadsheet	No
Automatic line routing	Yes	No	No
Line snaps to either other lines or shapes	Yes	No (shapes only)	No
Time to link 20 rectangles	30 seconds	119 seconds	Not available
Customer support	Unlimited	90 days	Unlimited
Multipage Charts	Yes	No	No

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Letters

ly in passing. I am the director of a small museum, and we use the 486 platform to run the SCO ODT operating system, which includes Unix 3.2.4. We operate WordPerfect, Lotus 1-2-3, and Filepro software.

We have been multitasking for years. With the increased capabilities of OS/2 and Windows, Unix/ODT doesn't seem to be out of your editorial scope if you are truly informing your readers of all of their computing options. I hope you will consider more coverage of the Unix operating system and software in your articles. Many computers advertised in your magazine mention Unix and Novell compatibility, and many software vendors, including Corel, Lotus, and WordPerfect, are releasing Unix versions.

STEVE HUMPHREY
EASTON, PENNSYLVANIA

Corrections

A punctuation error occurred in the DOS Hot Tip "Instant Access to Your Directories" (April, page 252). To remap your F10 key to show directory listings sorted by name and in wide format, add the line

```
ECHO ←[Ø;68;"DIR/O:N /W /P";13p
```

to AUTOEXEC.BAT and make sure ANSI.SYS is loaded in CONFIG.SYS. The left arrow indicates an Esc character in DOS's Edit. To generate the character, press Ctrl-P and Esc.

One of May's Software Secrets for dBASE III Plus ("How Old Are You?" page 266) included an incorrect code listing. The final *Y* in the last formula should be a 0 (zero). The correct listing is as follows:

```
BIRTH_YR = RIGHT(DTOC(DOB),2)
BIRTH_MD = LEFT(DTOC(DOB),2) +
  SUBSTR(DTOC(DOB),4,2)
THIS_YR = RIGHT(DTOC(DATE()),2)
THIS_MD = LEFT(DTOC(DATE()),2) +
  SUBSTR(DTOC(DATE()),4,2)
AGE = INT(VAL(THIS_YR) -
  VAL(BIRTH_YR) - IIF(VAL(THIS_MD)
  < VAL(BIRTH_MD),1,Ø))
```

In May's "DOS 6.0" story, we suggested that you could add the line SWITCHES/L to your CONFIG.SYS file to eliminate the 2-second delay that occurs after the "Starting MS-DOS" message (page 148). In fact, the line should be SWITCHES/F.

Also, due to an editing error, an incorrect price for the NEC Versa was published in the May issue (New!, page 40). The correct price is $4,269.

We regret the errors.

Mail your thoughts to Letters, PC/Computing, *950 Tower Lane, 20th Floor, Foster City, CA 94404; fax us at (415) 578-7029; or contact us via MCI Mail at PCC Editorial or via PC/Contact, our online forum. Letters must be signed and must include a daytime phone number. All letters become the property of* PC/Computing *and will be edited for length and clarity.*

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Airlines allow you two carry-on items; make one an AST PowerExec™ notebook. The 4/25SL, for instance, actually gives you enough power to autopilot a jumbo jet. But you may prefer to use it, instead, for up to 6¾ hours of non-stop computing, the longest battery life *PC Magazine* has seen from any 486-based portable.* When you land, use the two PCMCIA slots to send or fax information anywhere. And while the 4/25SL delivers the best performance in every category *PC Magazine* tests for, there are five other PowerExec models, starting at under $1,300.** For more information, call 800-876-4AST. For flight reservations, call your travel agent.



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POWEREXEC 4/25SL

Intel 486SL/25 microprocessor, optional active-matrix color display. 3.3-volt technology for longer battery life. Up to 32MB of RAM. "Top numbers in every test category" – PC Magazine

POWEREXEC 3/25SL

Intel 386SL/25 microprocessor, optional active-matrix color display. 64KB of external cache. Up to 20MB of RAM. Two PCMCIA slots. A Windows Magazine *"Best Buy"*

POWEREXEC EL

*Intel 386SL/25 microprocessor with optional passive color display. AST Intelligent Power Management. One PCMCIA slot. Priced from under $1,300***

SUPPORT

Just what you'd expect from a Fortune 500 *company. Technical support 24 hours a day, seven days a week. ExeCare* Plus includes free one-year warranty with 48-hour expedited repair or optional 24-hour replacement coverage.*

Call for more information.

800-876-4AST

intel inside

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New!

THE NUMBER ONE NETWORK OS GETS EVEN BETTER . . .

NetWare 4.0 Supports

CD INSTALL, HELP

One of the biggest improvements we found in our tests of NetWare 4.0 is the installation routine. What was once a tedious job is now automated. In addition, the Help system is much more accessible than in Version 3.11.

Unlike previous versions, NetWare 4.0 installs automatically from a CD-ROM. We also found NetWare 4.0 much more compatible with hardware. The Help system is on CD-ROM and includes easily searched information on upgrading from other versions of NetWare.

Shown at right is the Help system's introduction to different types of networks; it offers guidance on how to most efficiently share network resources.

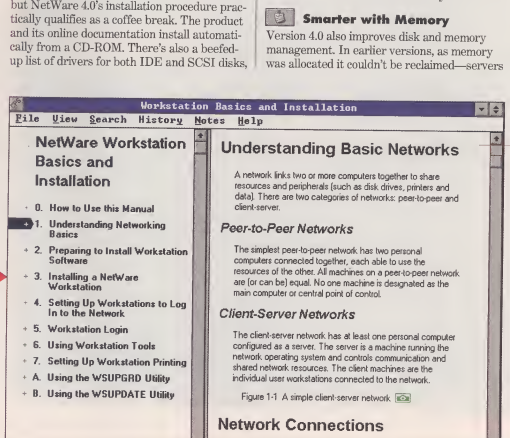
THE REIGNING CZAR of networking just got bigger, stronger, and smarter. NetWare 4.0 is a major improvement over NetWare 3.11, with new features that come straight from a LAN administrator's wish list. The most popular network operating system now supports up to 1,000 users on a single server instead of the previous limit of 250, and it's packed with unexpected extras such as utilities with Windows and Presentation Manager interfaces. (For a Guided Tour of some of NetWare 4.0's new features, turn to page 38.)

NetWare 3.11's installation routine was a major improvement over previous versions, but NetWare 4.0's installation procedure practically qualifies as a coffee break. The product and its online documentation install automatically from a CD-ROM. There's also a beefed-up list of drivers for both IDE and SCSI disks, as well as a host of new Network Interface Card drivers.

At the core of NetWare 4.0 is NetWare Directory Services (NDS), which cures the file chaos that plagues many large networks. NDS is a global database of network information (organized in the form of *objects*) that replaces NetWare's bindery and eliminates the need to know the name and location of the file server on which a file or directory is located. NDS offers transparent access to all resources including printers, fax servers, applications, and data files, whether they're located on the file server down the hall or across the country.

Smarter with Memory

Version 4.0 also improves disk and memory management. In earlier versions, as memory was allocated it couldn't be reclaimed—servers



FLASH!
COMPAQ'S PENTIUM BENCHMARKED
(SEE PAGE 40)

Much Bigger Networks

slowly ran out of memory and in some cases had to be rebooted to reclaim RAM. In addition, if a NetWare Loadable Module (NLM) misbehaved, it could overwrite other memory and either cause data loss or halt the server.

NetWare 4.0 corrects these problems. As memory becomes available, it's reclaimed automatically. New and questionable NLMs can be loaded in protected memory, where they cannot affect other RAM. The RAM requirement for a NetWare client has also been reduced by 6K thanks to a revamped DOS Requester.

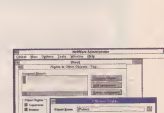
Disk Compression

If Version 4.0's significant improvements to memory management aren't enough to wow you, its built-in disk compression will. Data compression can be selectively applied to volumes, directories, or specific files, and global compression enables you to double your disk space.

For many LANs, Version 4.0's ability to support 1,000 users on a single server will be the overwhelming reason to upgrade, but the product is so full of extras that it's worth the upgrade even if you don't need room for more users. The only catch: NetWare 4.0 will roll out in tandem with Microsoft's Windows NT (see page 118), which will cost less than $100 per desktop. Look for comprehensive tests on NetWare 4.0 in our September issue, but our preliminary tests show Version 4.0 to be a major improvement over previous versions.

ADAM MEYERSON AND JOHN TASCHEK

NETWARE 4.0, 25 USERS, $4,659; 100 USERS, $8,795
122 E. 1700 SOUTH
PROVO, UT 84606
(801) 429-7000



CHECK-OFF RIGHTS
Assigning rights in NetWare is much easier than it used to be, primarily because of the new graphical utilities for administration. All the rights you could previously set in NetWare 3.11 can be set graphically by clicking on check boxes. NetWare 4.0 also lets you verify the effective rights attached to any "object," such as a group, a printer, and so on. The capability of setting directory rights proved to be a huge efficiency boost in our tests. (See screen 4 in the Guided Tour on page 38.)

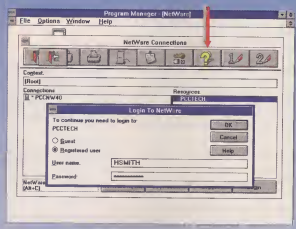
What's New in NetWare 4.0?

- **Supports up to 1,000 clients** as appased ta the previous limit af 250 users wha could simultaneausly lag in ta a server.
- **NetWare Directory Services (NDS)** is a global database af objects an the netwark that replaces NetWare's bindery. It eliminates the need ta knaw the name and lacatian af the file server an which a file ar directary is lacated.
- **Better NLM protection** means less dawntime. NetWare pravides a damain away fram the care aperating system where administratars can safely test laadable madules. NetWare also reclaims memary mare efficiently when unloading NLMs.
- **Real-time data compression** helps yau avaid dealing with "Out af Space" errar messages. Just set the switch, and NetWare will dauble your disk space.
- **Graphical utilities** with Windaws ar Presentatian Manager interfaces enable the NetWare administratar ta manage multiple resaurces simultaneausly. Yau can drag-and-drap users inta graups and graups inta servers. NetWare 4.0 alsa cambines the PCONSOLE, SYSCON, and FCONSOLE utilities inta ane.
- **Improved security** safeguards sensitive data. NetWare adds a new layer af access cantral that can be managed acrass multiple netwarks.
- **Wide area network (WAN) support** has been tightened and integrated inta NetWare 4.0. Twa new NetWare features—Large Internet Pratacal (LIP) and burst made—imprave perfarmance and lawer the casts af cannecting LANs ta WANs. The product alsa naw deals with multiple time zanes and daylight saving time.
- **Better backup services** enable NetWare ta back up client systems without third-party saftware. Performance has been impraved and mare hardware drivers have been added.
- **NetWare's improved client technology** reduces the memary hit an client PCs by 6K. NetWare drivers can naw be laaded inta upper memary blacks mare easily. NetWare alsa increases the number af parallel parts cancurrently available ta clients.

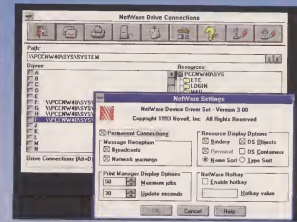
New!

NetWare Meets Windows: The OS Finally Gets a Graphical Front End

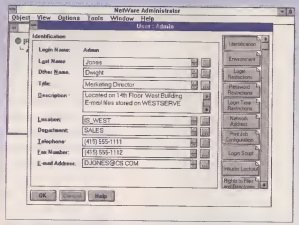
NetWare gets friendlier with Version 4.0. Administrators no longer have to remember which utility does what when they're adding users or managing resources—all utilities have been bundled into a single program. Best of all, you get Windows (and OS/2 Presentation Manager) interfaces.



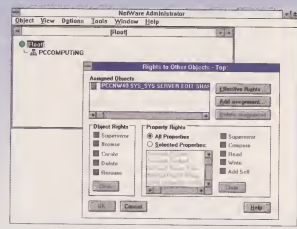
1. NetWare can be configured to prompt you with a Login dialog box as soon as you start Windows. Enter your user name and password, and you'll be immediately connected to the network. The Help icon on the button bar provides direct access to the NetWare manuals in Windows Help form.



2. The NetWare user utility offers a button bar that lets you configure or select any resource you want—such as drives and printers. This screen shows the NetWare Settings dialog box, which lets users receive or send broadcast messages as well as limit the resources displayed to only what is necessary.



3. Administration is a snap with the NetWare Administrator. If you add users through this menu, you have access to all their resources with the click of a button. You can change login scripts, limit access time, and determine print-job configurations through this utility as well.



4. Novell offers an easy way to set directory rights. Select the rights you want to assign to a directory by clicking on the appropriate check box. Notice that resources—such as drives, printers, and users—are now called *objects* (see the Root dialog box above).



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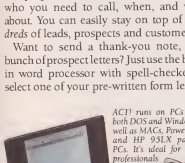
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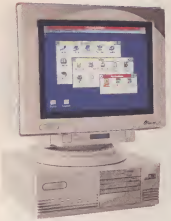
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Surprise! Compaq's Pentium Is Fast, but Not as Fast as a 486/66

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Like the other systems in Compaq's Deskpro M line, this system is ultramodular—all components reside on removable boards. That includes the 5/60M's 60MHz Pentium CPU, which sits on a proprietary board along with memory and an external secondary cache.



Even if you're using top-of-the-line 50MHz 486DX or 66MHz 486DX2 systems now, you'll see a dramatic speed improvement in processor-intensive applications like CAD or statistical analysis. Thanks to the Pentium's dual-pipeline and dual-cache architecture, the performance in such apps nearly doubles.

Windows apps, on the other hand, don't get as much of a boost since they depend more on I/O-bound peripherals like graphics and disk controllers than on the CPU/memory system. Compared to a similarly configured 50MHz 486 Compaq EISA-based Deskpro M, the Pentium-based 5/60M ran Windows apps almost twice as fast (see chart).

But when you compare the 5/60M to an optimally configured 66MHz 486DX2 with local-bus graphics, a Pentium system quickly loses its luster. The Ares 486DX2/66 VL-Bus—which included VL-Bus hard disk and graphics controllers—outperformed it with Windows apps. And the system can be had for under $3,500. These speed results may seem surprising, but remember that applications will soon be recompiled for Pentium systems, which will significantly boost performance.

We typically prefer systems that save you slots by integrating graphics, ports, and hard-disk controllers on the motherboard. That's not the case with the M systems, but even after you install graphics and the I/O board, four of its five EISA slots remain free. The I/O board—which includes circuitry for IDE, Business Audio, and ports—slips into a proprietary slot. And for desktop use, Compaq's system is no slouch in the expansion department: You can upgrade memory to 144MB, and there are three front-accessible drive bays in addition to the half-height bay inside.

For typical Windows users running apps like Excel and Word for Windows, this system is overkill in every respect—currently you'd be far better off getting a 486/66 with VL-Bus local-bus graphics. If you're an engineer, a designer, or a number-cruncher, Compaq's Pentium system makes a lot of sense, but you won't see the full benefit of its speed until applications are compiled specifically for the Pentium. In the meantime, a maxed-out 486 system like the Ares is—amazingly—faster with many standard Windows tasks, not to mention much cheaper.

GINA SMITH

WORTH IT YET?
Compared to 486s, Pentium systems are pricey: Compaq had yet to set pricing at this writing, but the company assured us that the configuration we tested will go for about $8,000. But to Compaq's credit, our evaluation unit came configured to the max. It included 16MB of RAM with a 256K cache (8MB is the standard with this unit), a 1,280-by-1,024-pixel EISA video card with 2MB of RAM, a 20-inch monitor, Compaq's Business Audio (including Microsoft's Windows Sound System), and a 510MB hard disk. So what accounted for the Ares 486DX2/66 system's better performance? Local-bus graphics and the lack of apps recompiled for the Pentium chip. Soon, though, 486 systems won't hold a candle to Pentiums.

PC/COMPUTING LAB REPORT:

COMPAQ IS FAST, BUT WAIT UNTIL PENTIUM-READY APPS ARRIVE

Tests consist of a series of common business tasks in several Windows applications. Longer bars represent better performance relative to the Compaq 486/50.

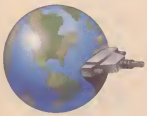
Product	Word for Windows (mixed tasks)	Excel test (graphics)	CorelDraw (graphics)
Compaq deskpro 5/60M (Pentium)	76% Faster	57% Faster	96% Faster
Ares 486DX2/66 VL-Bus	97% Faster	129% Faster	108% Faster
Gateway DX2-66	19% Faster	31% Faster	28% Faster
Compaq 486/50	Baseline	Baseline	Baseline

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❑ Lotus 1-2-3 Windows 1.1 Item #61837-16	F3	$ 325
❑ Lotus 1-2-3 Windows 1.1 Upgrade Item #54832-16	F3	$ 99
❑ Microsoft Excel for Windows 4.0 Item #53253-16 (5.25 available)	F3	$ 289
❑ Microsoft Excel for Windows 4.0-Upgrade Item #44625-16 (5.25 available)	F3	$ 119
❑ Lotus 1-2-3 2.4 Item #67606-16	F3	$ 339
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$99 Lotus 1-2-3 Upgrade

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❑ WordPerfect 5.2 for Windows-Upgrade Item #11095-19 (5.25 available)	F3	$ 87
❑ Microsoft Word for Windows 2.0b Item #64932-19 (5.25 available)	F3	$ 299
Word Processing Con't		
❑ Microsoft Word for Windows 2.0b-Upgrade Item #62910-02 (5.25 available)	F3	$ 115
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❑ Lotus Ami Pro 3.0 Upgrade Item #32259-19	Duol	$ 99
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❑ Borland Paradox 4.0 Item #63325-08	F5	$ 529
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❑ Microsoft Office 3.0 Item #49836-13	F5	$ 449
❑ Spinnaker PFS: WindowWorks 2.0 Item #40941-13	F3	$ 45
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❑ Intuit Quicken for Windows 2.0 Item #45870-02	Duol	$ 45
❑ Intuit Quickbooks Item #38392-02	Duol	$ 89
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PERIPHERALS AND ACCESSORIES

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❑ Creative Labs Sound Blaster Pro Item #61991-54	Int	$ 189
❑ MediaVision Pro 16 Multimedia System Item #23507-54	Int	$ 909
❑ MediaVision Fusion 16 Multimedia Upgrade Kit Item #98924-25	Int	$ 559
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HP's DeskJet 1200C Excels at Adding Spot Color to Documents

GRAPHICS OR TEXT?
That's one of the primary trade-offs when you buy any printer. A printer is rarely designed to be as great at graphics printing as at text, but the 1200C does both well, and it's particularly well suited for adding spot color. Whether you're adding spot color to text (see top sample) or printing full-blown presentations (bottom), the 1200C offers good-looking output. Compared to Hewlett-Packard's PaintJet XL300, we found that the DeskJet 1200C costs less than half as much per page of color output. Our speed tests showed the 1200C to be even faster than HP's monochrome LaserJet 4L at text printing (see chart).



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STILL WAITING FOR the printer that lets you add color to documents without sacrificing speed or print quality? We are, too. Color ink jets aren't the perfect solution—but with the DeskJet 1200C, Hewlett-Packard has increased the attractiveness of ink jet printing.

Ink jet printers come in two varieties: smart and dumb. The designations have nothing to do with IQ scores—*smart* printers, such as laser printers, have internal processors to rasterize page data; *dumb* printers use your computer's processor. Each type has advantages. Smart printers are fast but usually cost from $500 to $1,000 more than dumb printers.

By putting an 11MHz Intel RISC processor inside the DeskJet 1200C and doubling the number of print nozzles, Hewlett-Packard claims to have nearly tripled the speed of ink jet printing. But in our tests it printed only about twice as fast as Canon's BJ-200, the ink jet category winner in the Hardware Buyer's Superguide. Despite its slower-than-promised performance, the DeskJet 1200C is still the fastest ink jet we've tested. It printed monochrome text about half a page per minute faster than HP's 4-ppm LaserJet 4L. For even quicker printing, the DeskJet 1200C has a fast printing mode.

While it's not quite as fast as some of the color thermal wax-transfer printers we've tested recently, the 1200C printed our 8-page PowerPoint presentation in just under 8 minutes—about half as much time as Canon's color BubbleJet, the BJC-800. The DeskJet's print quality in normal mode was acceptable for spot color, but for full-page color slides we recommend using high-quality mode. It smooths out the banding and dithering patterns, and looks great even on plain copier paper (see top sample at left).

What's more, the DeskJet 1200C won't break the bank. Its cost of operation is lower than that of most color ink jet printers. A page with 30 percent ink coverage costs about 51 cents when printed on HP's PaintJet XL300. The same page costs about 17 cents on the DeskJet 1200C.

Straight black-and-white-text print speed is slow for a networked printer, but for combination printing, such as when you're highlighting an important point in color or adding color charts to sharpen up business reports, the inexpensive DeskJet 1200C is the best we've tested.

CYNDY BATES



The DeskJet 1200C's cost of operation is much lower than that of other color printers.

PC/COMPUTING LAB REPORT:

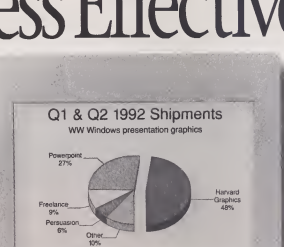
THE DESKJET 1200C'S SPEED FALLS BETWEEN THE LASERJET 4'S AND 4L'S

Longer bars represent better performance relative to the HP LaserJet 4L. Tests were performed in PCL mode at 300 dpi.

Product	WordPerfect for DOS	Word for Windows	PowerPoint (graphics)
HP LaserJet 4 (rated at 8 ppm)	102% Faster	105% Faster	295% Faster
HP DeskJet 1200C (rated at 6 ppm)	14% Faster	13% Faster	38% Slower
HP LaserJet 4L (rated at 4 ppm)	Baseline	Baseline	Baseline

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❑ Harvard Graphics for Windows

NAME:_____
COMPANY: _____
ADDRESS: _____ *(No P.O. Boxes)*
CITY: _____ STATE:_____
ZIP: _____ DAYTIME PHONE:_____

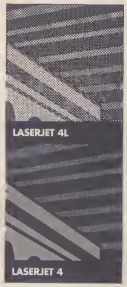
See your dealer or call SPC Customer Service at (408) 988-7518 for details and restrictions. Offer applies for purchase of Harvard Graphics 3.0 for DOS or Harvard Graphics for Windows product made between May 15th and August 31st, 1993. Send completed coupon with dated proof of purchase (original only) to: Software Publishing Corporation, **ATTN: PRESENTATION PAK OFFER, P.O. Box 4000, Crawfordsville, IN 47933.** *Allow 4 weeks for delivery. Offer must be redeemed within 30 days of original purchase, and no later than September 30, 1993. Offer is not transferable. One Presentation Pak per purchase. Cash redemption value: 1/100 of 1 cent. Software Publishing Corporation is not responsible for lost or misdirected mail.*

(SKU= 15-Pak)

Sharp—and Green—LaserJet 4L: Almost as Cheap as an Ink Jet

THE DPI TRADE-OFF

What makes for great-looking output in monochrome printers? The number of dots per inch. As you can see from these output samples, the LaserJet 4L's 300-dpi



output (top) isn't as good as the LaserJet 4's 600-dpi output (bottom). More dots per inch make for a crisp look in complex graphics. If you print a lot of graphics, the LaserJet 4 will make more sense for you than the 4L.

Still, the 4L is perfectly suitable for most users and can be bought on the street for under $800, while the LaserJet 4 costs a whopping $1,749.

HP LASERJET 4L, $849
HEWLETT-PACKARD
P.O. BOX 58059,
MS3 11SJ
SANTA CLARA, CA 95051-8059
(800) 752-0900

BIGGER ISN'T ALWAYS better. Especially when it comes to personal laser printers. Hewlett-Packard's LaserJet 4L, the successor to the LaserJet IIP Plus, has a modest footprint and an extraordinarily modest price tag to match. At only $849, the 4-page-per-minute LaserJet 4L is an excellent value for convenient localized printing. Even better, it's also ecologically correct, consuming 80 percent less energy than a conventional personal laser.

The LaserJet 4L offers no frills, but it requires no sacrifices either. The 300-dot-per-inch engine uses microfine toner and HP's Resolution Enhancement Technology (RET) for the best possible print quality (see left). The printer comes standard with only 1MB of RAM, but thanks to Enhanced PCL 5 data compression, that 1MB is enough to print graphics-laden documents that normally require 2MB. The LaserJet 4L also includes 26 scalable Intellifont typefaces, a Bi-Tronics parallel port, and a 100-sheet paper tray—not quite as rich a configuration as the LaserJet 4's, but more elaborate than that of its predecessor, the LaserJet IIP Plus.

The LaserJet 4L's compact 14.5-by-14-inch footprint takes up about as much room on your desk as a large in-box. In keeping with the trim footprint, the parallel port and power input are located in recessed panels on either side of the printer—handy for cramped quarters where every inch counts.

It's Green

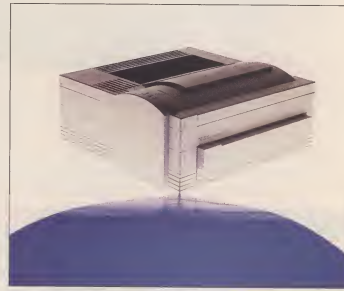
The LaserJet 4L is easy on the environment—and on your wallet. Conforming to the U.S. Environmental Protection Agency's Energy Star standards, the LaserJet 4L powers down between print jobs and uses 80 percent less energy than the LaserJet IIP Plus. In addition, the 4L offers a draft printing mode that lays 50 percent less toner on the page, although it doesn't speed up printing.

Solid Performer

The LaserJet 4L's performance is about what you'd expect—it's half that of the 8-ppm LaserJet 4 (see New!, December 1992, page 46) and more than twice as fast as Canon's BJ-200 printer (see New!, February, page 86). As shown in the benchmark chart with the review of HP's DeskJet 1200C on page 44, the 4L is nowhere near as fast as the LaserJet 4 when printing graphics. If you print a lot of presentation or other kinds of graphics, a LaserJet 4 makes more sense than a 4L. The 4L's print quality is quite good—output is even sharper than with the LaserJet III, thanks to the 4L's microfine toner.

With street prices expected at under $700, the LaserJet 4L presents a serious challenge to many ink jet printers. For only a few hundred dollars more than an ink jet, the LaserJet 4L delivers better performance and better output. Besides, you'll quickly make up the difference in lower toner and electricity bills.

CYNDY BATES



The LaserJet 4L, though it lacks frills, makes personal laser printing extremely inexpensive—and its trim size makes it convenient.

CACHE ROM C&T 286 IPX DRIVERS UMB 386MAX QUALITAS BLUEMAX 486SX BUFFERS MODEMS EGA BIOS
MEMORY TSRs MOUSE XMS HIGH DOS EGA INITIALIZE HMA WINDOWS 640K NETWORKS 386SX PAGEFRAME CACHE LIM EMS DPMI CD ROMS UMB 386MAX RAM
BLUEMAX 286 486SX EGA DRIVERS 486 C&T 286 DOS 5.0 HMA WINDOWS VGA MOUSE DPMI BIOS HIGH DOS TSRs NETWORKS XMS INITIALIZE RAM FAX BOARD
RAM PAGEFRAME BIOS MEMORY VGA MOUSE TSRs HIGH DOS EGA INITIALIZE DPMI MODEMS 640K FAX BOARD 386SX

When running DOS applications in Windows, is there something you're running out of?



Introducing 386MAX Version 7.

If you use DOS applications under Windows, you know how quickly memory gets used up. Which is why you should explore new 386MAX® Version 7, the most effective memory manager in the universe.

That's because new 386MAX is so well integrated with the workings of DOS, you actually get better, more flexible DOS under Windows than with DOS alone. Including up to 736K of conventional memory in each DOS session thanks to our powerful new Windows features. That's 100K more than you'll get even with the improved memory management built into new DOS 6. Plus, new 386MAX makes it easy to get top performance from each DOS application in Windows by guiding you effortlessly to the optimum configuration for your system.

We even make DOS itself better, especially if you move to new DOS 6. By freeing up extra memory for applications, and for using more of the 270K of the built-in DOS 6 utilities. By giving you more intelligent, more automated memory management features, including new QMT, the easy, reliable way to test the integrity of your memory.

And by providing new MultiConfig Maximize which, unlike DOS 6, ensures fully optimized memory in a number of different boot configurations.

So if you're looking for a memory manager that really shines, there's no need to search the galaxies. Instead, get new 386MAX 7 for any 386, 486 or Pentium™-based PC for just $99.95. Or get BlueMAX™ 7 for genuine IBM brand PCs at just $124.95.



The Intelligent Memory Manager™

Both of these intelligent memory managers are available from your software dealer, or order directly from TigerDirect by calling 1-800-888-4437.

1992 ANNUAL WINNER PCO W WINDOWS WIN AWARD

yes It runs with NetWare

© 1993 Qualitas. All company and product names are trademarks or registered trademarks of their respective owners.
System requirements: Any 386, 486, or Pentium micro-processor based PC or PS/2, min. 256KB of extended memory, DOS 3.3 or higher, high density floppy disk or hard disk drive.

Circle 226 on reader service card.

LASERJET 4 FAX ADD-ON

Wont on inexpensive woy to get ploin-poper foxing? Extended Systems (800-235-7576) offers the FoxConnection MFP—a $695 fax oddon for Hewlett-Packord's LaserJet 4. The FaxConnection MFP fits into



the LaserJet 4's open interfoce slot. Simply connect o phone line ond the printer to your computer, ond you've got o ploinpoper send/receive fox stotion.

Whot's notable obout the FoxConnection MFP is that, unlike with mony printer/fox solutions, your PC can directly receive faxes os well os send them. Sending and receiving worked flowlessly in our tests.

The FoxConnection MFP includes 512K of RAM for storing foxes while the printer is busy or offline, olong with Faxit softwore for DOS and Windows.

CYNDY BATES

CorelDraw 4.0: Slick One-Stop Shopping for Every Graphics Task

CORELDRAW 4.0, $595 (CD-ROM ONLY, $545) COREL CORP. 1600 CARLING AVE. OTTAWA, ONTARIO, CANADA K1Z 8R7 (800) 836-3729

COREL DRAW, THE wildly popular all-in-one graphics package from Corel Corporation, once again eclipses the competition. CorelDraw 3.0 was the first graphics package to include everything required for drawing, painting, charting, designing, and presenting *anything*, all in a single box. The newest incarnation of the program, CorelDraw 4.0, packs even more value into a $595 package, offering advanced page-layout features, more sophisticated artist's tools, and other business-graphics enhancements.

The most noticeable enhancements to CorelDraw 4.0 are to the vector-drawing and illustration modules, which now can also handle design-intensive page layout tasks. Whereas CorelDraw 3.0 handles only single-page documents—fine for flyers and one-page ads but inadequate for brochures and publications—CorelDraw 4.0 creates documents up to 999 pages long. Also new are advanced text-handling features. Import text from your word processor, and CorelDraw will automatically generate frames and pages to hold it. You can wrap text around other objects, drop it into odd-shaped containers, or flow it between containers—features that have traditionally been available only in specialized illustration programs such as Adobe Illustrator.

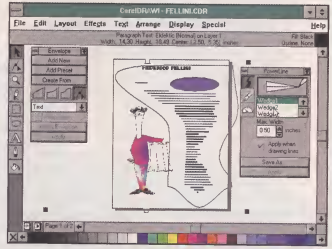
New tools called PowerLines imitate the behavior of real brushes or calligraphic pens even without the help of a pressure-sensitive tablet (although Version 4.0 supports those as well). CorelDraw's technical-illustration features now compete with the likes of Micrografx Designer. You can, for example, clone objects for creating floorplans or drafting building designs. If you change the size or color of the original object, the change ripples through all of the clones. Other useful additions are CorelDraw 4.0's new drag-and-drop symbol libraries, which are similar to the stencils found in Shapeware's Visio.

Other modules in the program have also been refined. The data manager underlying CorelChart now behaves like a real spreadsheet, so you can perform calculations directly as well as format cells, text, and borders. The presentation module, CorelShow, has also been refashioned so that you can add more razzle-dazzle to presentations with animations and multimedia cues. A new module, CorelMove, lets you create basic animations using canned actors or by creating your own in CorelDraw.

CorelPhoto-Paint, the image editor, adds direct support for scanners (including TWAIN support) and includes new brushes, filters, masks, and other tools for transforming images. CorelTrace is Corel's bitmap-to-vector and optical character recognition (OCR) conversion utility. The OCR utility won't replace a full-fledged OCR package, but it's adequate for occasional use. CorelMosaic, the package's image organizer, is still intact, and the Corel libraries (which hold 750 fonts, 18,000 pieces of clip art and symbols, and hundreds of canned animations) now occupy two CD-ROM discs.

CorelDraw 3.0, meanwhile, isn't going away—it has merely become a better bargain. Expect to see it for an unbelievably low $199. Whichever version you choose, you won't find a better bargain anywhere.

WENDY TAYLOR



CorelDraw 4.0 now doubles os o poge-layout progrom, outomatically generoting fromes ond poges for imported text.

You Party Animal!



Gateway 2000™
486 Fest

Go Hog-Wild During Gateway 2000's

Need a reason to celebrate? We're making this the best summer ever to buy a Gateway PC! During our 486 Fest, you'll find better-than-ever buys on all the fabulous systems in our product line. You'll think you died and went to hog heaven! Buy some fiesta goodies, invite a few party animals over and call us. We'll give you lots of reasons to party!

Party Reason — *Gateway's Pentium Technology Guarantee!*

If you've been worried about keeping up with technology now that Intel's® Pentium™ processor has been announced, relax! Ask about our Pentium Technology Guarantee. It's a Gateway-exclusive offer that allows you to keep up with technology *and* save big bucks — guaranteed!

Party Reason — *Choosing a 486 system shows you're a smart buyer!*

A less astute buyer might go for a 386 or Pentium system, but you know where the real value is. Gateway 2000's desktop and Nomad PCs are now all 486 systems for good reason. With our great prices on 486 technology, 386 systems are no longer a smart buy. And first-generation Pentium systems are not a good value.

Even if you were willing to pay the steep premium other manufacturers are charging for Pentium systems, you'd have trouble getting one because availability is extremely limited. Our engineers say the Pentium systems in our lab run so hot, you could use one to heat a hog house. Besides, Pentium systems on the market today will be outperformed quickly by improvements in Pentium technology.

That's why we're not selling Pentium systems yet. At Gateway, we won't sell anything unless it's a good value for you.

In today's market a 486 machine is the way to go, especially now that all our desktop ISA systems are *guaranteed* to be upgradeable to Pentium technology.

Gateway 2000™ 486 Fest

Party Reason — *If you pick a mini desktop, you'll save enough to invite the whole barnyard to your party.*

Gateway's mini-desktop systems — 4SX-25, 4SX-33 and 4DX-33 — are petite but powerful, based on an integrated



486 Fest!

design that incorporates many subsystems on the motherboard for the best price-performance ratio. All mini desktop systems include: 4 to 8MB RAM; a large and fast hard drive, operating on the local bus for even faster drive performance; a fast video chipset with 1MB; a brilliant, crisp display from the standard 14-inch CrystalScan® non-interlaced, .28mm dot pitch color monitor; and more available expansion slots than you find in most small-footprint PCs. The combination of these features makes a cool Windows™ machine for an unbeatable price. Now that's cause for celebration!

Party Reason — *You'll be wallowing in ecstasy if you buy a local bus system.*

Go ahead and splurge on our 4DX2-50V or 4DX2-66V models. We put ATI's™ Graphics Ultra Pro video card with 1MB VRAM on our VESA® local bus for results that will be the hit of your party. Plus these systems have a hefty 8 to 16MB RAM with cache, and party-hearty hard drives running on the local bus. You get an extra VESA local bus expansion slot, a 15-inch flat, square CrystalScan color monitor, and more free choices of application software than you'll find anywhere else.



In PC Magazine's *Battery Rundown Test, Nomad systems operated up to 6 hours on a single battery with power management enabled.*

Party Reason — *Three cheers for 486 desktop performance in a lightweight portable!*

Why settle for a 386 notebook when you can get a powerful 486 Nomad in the same price range? All three Gateway 2000 Nomad models are 486 systems with snappy performance that's still rare in notebooks. Plus, they're smaller than many notebooks, weighing just 5.6 pounds and measuring 8.5" x 11" x 1.8". No other notebook this size can beat the Nomad 450DXL's combination of performance and battery life! Nomad screens are big, brilliant and backlit for use in all lighting conditions. The 79-key touch-type keyboard is comfortable, quiet and fast. Nomad 450DXL models now also include Microsoft's® Ballpoint™ portable mouse with Quickport,™ standard.

The Gateway 2000 4DX2-50V at $2295 is a favorite with our three little pigs.

GATEWAY2000

800-846-2062



Party On! We Give You More Software

Keep counting the reasons to celebrate during Gateway's 486 Fest! You'll find plenty when you look at our selection of software and peripherals.

Software

We offer more free choices of application software with our systems than any other manufacturer. Plus, all software is pre-installed and ready to run the moment your system arrives. Hooray! No installation hassles!

With Nomad, mini desktop and our 4DX2-66 Best Buy systems, you get one of the best integrated software packages on the market.

Party Reason — *Microsoft Works for Windows.™*

With desktop and tower systems that include "choice of application software," you can select one of the following software packages. All applications are the latest versions.

Party Reason — *Microsoft Excel for Windows.™*

Party Reason — *Microsoft Word for Windows.™*

Party Reason — *Microsoft Word and Bookshelf 92.® CD-ROM Edition.*

Party Reason — *Microsoft PowerPoint for Windows.™*

Gateway 2000™ 486 Fest

Party Reason — *Microsoft Project for Windows.™*

Party Reason — *The MS Entrepreneur Pack* (Works,™ Publisher,™ Money,™ and games).

Party Reason — *Borland Paradox® and Quattro® Pro for Windows.*

Party Reason — *The Windows Programmer Pack* (MS Quick C,™ Visual Basic™ and more).

Party Reason — *Upgrade to the CD-ROM Edition of Microsoft Office.™*

You can upgrade from a choice of application software to Microsoft Office, CD-ROM version, for only $99! This single package has all the leading Windows applications: Word, Excel and PowerPoint. The standard edition of MS Office is also available as an upgrade from a choice of application software for $175, or $499 as a second application.

Party Reason — *Upgrade from Works to choice of application.*

If the system you want comes with MS Works for Windows, you can upgrade to a choice of application software for only **$100**.

Peripherals

Party Reason — *You'll save money on connectivity tools!*

TelePath™ Fax/Modem. The Gateway 2000 TelePath is a 14,400bps modem, V.32bis, with 9,600bps fax capability. Package includes software — WinFax Pro,® Crosstalk™ for Windows and Qmodem — plus a free CompuServe® trial membership. **$195**



...nd Peripherals To Crow About!

Network Cards. Call for a selection of Ethernet cards and Token Ring adapters, installed and configured.

Microsoft Windows™ for WorkGroups. Networking made easy! Share files and printers, send electronic mail, schedule group meetings with the click of your mouse — and get everything you need in one inexpensive package. Price includes an Ethernet adapter and software. Hardware and software are factory-installed. **$159**

Party Reason — *You'll save money on multimedia software and peripherals!*

CD-ROM Kit. You'll enter a whole new world of possibilities with your PC when you add a CD-ROM drive, giving you access to exciting new applications, databases and entertainment programs. Kit includes CD-ROM, interface card and everything you need to add MPC-compliant CD-ROM to your PC. **$225**

Microsoft Windows Sound System.™ Here's the sound system designed for business, complete with a headset for private office use. With it you can "speak" commands to your PC for hands-free operation. Embed audio messages in Windows OLE applications. Play your Ad Lib® and Sound Blaster™ games — and more! Our special Gateway price includes soundboard, microphone, headset and software. **$149**

Party Reason— *You'll save money on all kinds of extras from Gateway!*

Colorado Memory Systems™ TBU. 250MB internal automatic tape backup unit copies up to 9.5MB per minute with high-speed data compression. Comes with easy DOS software, one tape and cable. **$195**

Texas Instruments® MicroLaser™ Plus Laser Printer. The MicroLaser Plus is only 13.4" x 14.2", yet it prints 9 pages per minute at 300dpi. Call for 486 Fest price!

Panasonic® KXP2123 Color-Capable Printer. Add color to your documents with this 24-pin dot matrix printer. Includes Adobe Type Manager.® Call for 486 Fest price!

We offer many other system options and upgrades, including 17- and 20-inch monitors, tape backup units, bigger hard drives, other software and more! Call today!

The software and peripherals listed here are sold only with the purchase of a system. For details on our complete line of extras for Gateway customers, ask for our special add-on components division when you call. Software sold with systems includes the identical applications contained in retail packages but will not include the retail box. You get all master diskettes and manuals, shrink-wrapped and packaged in a Gateway 2000 box.

intel inside

Everyone's flocking to check out the life of the party, Gateway's 4DX2-66 Best Buy system shown with optional Labtec speakers.



GATEWAY2000

800-846-2062



The Whole Herd Is Dedicated To

Yes, this is the whole gang at Gateway 2000. We now number in excess of 2,000 people. We gathered everyone together for this 486 Fest kick-off photo so you could see all the friends you have in the business, and so we could renew our commitment to your complete satisfaction.



Despite some blustery weather, Ted, our president and founder, gave us an inspiring pep talk about customer satisfaction and value. He reminded us that we will be the best in this industry only as long as we remember the guiding principles of our company, best described in our mission statement:

We are Gateway 2000.
We care about and respect you, our customers.
We pledge to you that we will be honest, courteous and friendly.
If we make a mistake, we will admit it.
If you're unhappy about something, we'll do everything in our power to make it right.
We'll treat you as an individual and take special care to see that your individual situation is handled fairly.
We have fun working together, striving to be the most knowledgeable, productive and successful team in the world.
We blend our talents to continually offer higher quality, more innovative and useful products, at a value unmatched by competitors.
We will always be happy but we will never be satisfied.
And we will continually improve everything we do.
We will succeed, together as a team.
We are Gateway 2000.
We are the only logical choice!

Gateway 2000™ 486 Fest



Providing The Best Service!

Party Reason — *You'll like doing business with people who care about you!*

Each and every person in this photo rededicated his or her efforts to achieving these goals. Like a married couple going through a second wedding ceremony after many years of marriage, our energies were refocused on what's important. And what's important to us is *you*!

Party Reason — *You get excellent after-the-sale support!*

Every Gateway 2000 system comes with a **30-day money-back guarantee**. If you don't like your system, send it back within 30 days for a refund. All systems come with a **one-year limited warranty** and telephone **technical support** for the life of the system from our award-winning tech department. You also get an **automated fax service** to supply you with detailed documentation on over 150 technical subjects, and a **lifetime BBS membership** for additional technical support and online forums.

We offer **on-site service** to most locations in the country (factory service only for notebooks). **Replacement parts** leave our factory as quickly as possible; we pay overnight shipping. Plus we now have **interactive documentation** on desktop systems with pictures and text right on your hard drive (in addition to comprehensive hardware and software manuals).

Party Reason — *It's so easy! Just give us a call!*

We make it easy for you to buy a Gateway PC, with convenient payment options including major credit cards and C.O.D. terms. Net 30-day terms and leasing options are also available to qualified commercial customers.



For a truly celebrated value, the choice is black-and-white: Gateway's 4DX-33.

GATEWAY2000

800-846-2062

Gateway 2000's Party List

4SX-25

- 25MHz 486SX Intel® Processor
- 4MB RAM
- 3.5" Diskette Drive
- 170MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- **Intel Pentium™ Technology Ready**
- Windows Accelerated Video w/1MB DRAM
- 14" Color CrystalScan® 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey® Keyboard
- MS-DOS® 6, Diags, Windows™ & Mouse
- MS Works for Windows™ 2.0

$1295

4SX-33

- 33MHz 486SX Intel Processor
- 4MB RAM
- 5.25" & 3.5" Diskette Drives
- 212MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- **Intel Pentium Technology Ready**
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- MS Works for Windows 2.0

$1495

4DX-33

- 33MHz 486DX Intel Processor
- 8MB RAM, 64K Cache
- 5.25" & 3.5" Diskette Drives
- 212MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- **Intel Pentium Technology Ready**
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- MS Works for Windows 2.0

$1895

4DX2-50V

- 50MHz 486DX2 Intel Processor
- 8MB RAM, 64K Cache
- 5.25" & 3.5" Diskette Drives
- 340MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- **Intel Pentium Technology Ready**
- ATI™ Ultra Pro Video w/1MB VRAM on VL-Bus™
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 7 16-Bit ISA Slots, 2 on VL-Bus
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

$2395

4DX2-66 BEST BUY

- 66MHz 486DX2 Intel Processor
- 8MB RAM, 64K Cache
- 3.5" Diskette Drive
- CD-ROM Drive
- 340MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- **Intel Pentium Technology Ready**
- Windows Accelerator w/1MB DRAM on VL-Bus
- 14" Color CrystalScan 1024NI
- Desktop Case (Tower Upgrade)
- 7 16-Bit ISA Slots, 2 on VL-Bus
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- MS Multimedia Works, CD-ROM Edition

$2495

4DX2-66V

- 66MHz 486DX2 Intel Processor
- 16MB RAM, 256K Cache
- 3.5" Diskette Drive
- CD-ROM Drive
- 340MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- **Intel Pentium Technology Ready**
- ATI Ultra Pro Video w/1MB VRAM on VL-Bus
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 7 16-Bit ISA Slots, 2 on VL-Bus
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

$2995

4DX2-66E

- 66MHz 486DX2 Intel Processor
- 8MB RAM, 256K Cache
- 5.25" & 3.5" Diskette Drives
- 500MB 11ms SCSI Hard Drive
- 32-Bit EISA SCSI Controller
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan 1024NI
- Tower Case
- 8 32-Bit EISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

$3495

NOMAD 425SXL

- 25MHz 486SX Intel Processor
- 4MB RAM
- 3.5" Diskette Drive
- 120MB IDE Hard Drive
- Backlit 10" VGA Screen, 64 Gray Scale
- Simultaneous Video with 1MB
- Size 8.5" x 11" x 1.8," 5.6 Lbs.
- 6-Hr. NiCad Battery & AC Pack
- 1 Parallel / 1 Serial Port
- 79-Key Keyboard & FieldMouse™
- MS-DOS and Windows
- MS Works for Windows

$1995

NOMAD 450DXL

- 50MHz 486DX2 Intel Processor
- 3.5" Diskette Drive
- Backlit 10" VGA Screen, 64 Gray Scale
- Simultaneous Video with 1MB
- Size 8.5" x 11" x 1.8," 5.6 Lbs.
- 6-Hr. NiCad Battery & AC Pack
- 1 Parallel / 1 Serial Port
- 79-Key Keyboard & MS Ballpoint
- MS-DOS, Windows & Works for Windows

$2495
(With 4MB RAM and 120MB Hard Drive)

$2795
(With 8MB RAM and 200MB Hard Drive)

Printed on recycled paper with soy inks

All hard drive sizes are manufacturer's specified capacities. Microsoft MS-DOS 6 can increase hard drive capacity through software compression.

GATEWAY2000
"You've got a friend in the business."®

800-846-2062

610 Gateway Drive • P.O.Box 2000 • North Sioux City, SD 57049-2000 • 605-232-2000 • Fax 605-232-2023

Sales Hours: 7am-10pm Weekdays, 9am-4pm Saturdays (CT)

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Before you leave your home or office, how many times have you stopped and wondered if you should take your notebook? Most people using standard-size notebooks weigh this decision carefully! Who wants to lug a bulky, cumbersome notebook if it's not absolutely necessary? With the HandBook, you won't think twice. At just 2.75 pounds, 6 x 10 inches, the HandBook is small enough to go anywhere you think.

But don't let its size fool you. The HandBook has plenty of power for most portable PC users' needs. Plus, this award-winning design has a 40MB hard drive, a bright, 7.6-inch backlit screen, a comfortable, 78-key touch-type keyboard, and excellent battery life — over four hours with power management.

Best of all, the HandBook is sporting a new, lower price. It's just $995, a savings of $300. In addition, you now get your choice of Miscrosoft Works for DOS 2.0 or WordPerfect for DOS 5.1.

Better call us today. When it comes to portables, it doesn't get any better than this!

Now Only **$995**



GATEWAY2000

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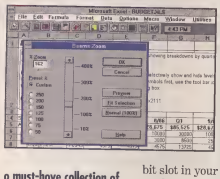
NIFTY EXCEL TOOLBOX

Excel 4.0 is os looded with feotures os Windows spreodsheets get, but Boorns Utilities from Boorns Consulting Group (800-377-9235, 818-364-6148) tokes Excel to even greoter heights. It's o must-hove collection of Excel tools, most of which ore icons thot can be incorporoted into ony of Excel's toolbors.

Our favorite tool is Boorns Zoom, which offers flexible ways to mognify and reduce your spreodsheet view. Boorns Templote Wizord works like the other Wizords in Excel and outomotes the process of building reusoble templotes. Boorns AutoSove outomatically soves your open documents ot preset intervols.

At $69.95, this collection of utilities is o number cruncher's dreom.

BRUCE SCHNEIER



Intel's Smart Video-to-PC Board—Usability Champ and Great Value

INTEL SMART VIDEO RECORDER, $699
INTEL CORP.
2200 MISSION COLLEGE
P.O. BOX 58119
SANTA CLARA, CA 95052
(800) 538-3373

CUT! IF YOU think video on the PC is strictly for wonky Hollywood types, think again. Intel's video-to-PC Smart Video Recorder makes desktop video production feasible for anyone who has Windows, a 486, and a little imagination.

A video-capture board for Windows, the $699 Smart Video Recorder receives full-motion video from a camcorder, VCR, or laserdisc and writes it to an editable file on your hard drive. Intel's board isn't just for hobbyists either—it comes bundled with more than $700 worth of business software including Asymetrix's Compel (see New!, May, page 80), Microsoft's Video for Windows, and a CD-ROM crammed with video clips. In particular, the inclusion of Compel makes Intel's package a bargain.

Slip Intel's full-length video-capture board into a 16-bit slot in your PC, plug in a VCR, camcorder, or other video device—and you're ready for action. Intel's board captures true full-motion video at 30 frames per second in a 160-by-120-pixel postage-stamp-size window or at 15 frames per second in a 320-by-240-pixel quarter-screen window (the minimum acceptable capture rate for motion video).

On-the-Fly Compression

Unique to Intel's board is its i750 processor. The chip enables the board to compress video as it records it, a process that requires less disk space and time than capturing and compressing the video in two separate steps does. In our tests, a one-minute video clip was compressed on the fly from 35MB to 9MB. We found the quality of the video it records to be quite good—it was more than adequate for creating clips to add drama to a presentation and on a par with footage that we captured using another board, SuperMac Technology's $499 VideoSpigot for Windows (see New!, February, page 68).

Recording and playback of video clips is handled by Microsoft's Video for Windows, which also includes basic tools for editing files once they're recorded in audio video interleave (AVI) format. In addition, you can add sound to your movies, though you'll need a sound card to do this. Ideally, you'll also want a CD-ROM drive; Intel includes a CD-ROM filled with video clips and musical scores that you can use as well.

Organize Your Clips

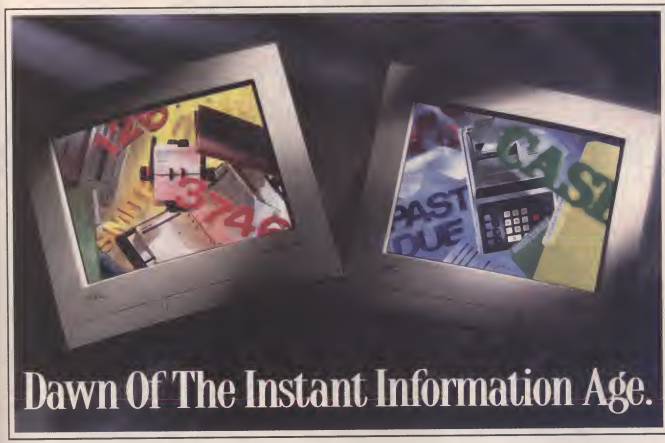
Intel also throws in MediaBlitz, a multimedia organizer. This combination of business software and single-step video-compression technology currently puts Intel's board ahead of any other video-capture card. In particular, we found the product's capability to compress video during the recording process to be an incredible convenience. This is the kind of usability enhancement that makes a product the clear leader in its category.

Whether you're just flirting with desktop video or ready to get serious, Intel's Smart Video Recorder is your best bet.

WENDY TAYLOR



Intel's Smart Video Recorder beats the competition—such os VideoSpigot—by compressing video os you record it.



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Media Code PCC

Hardware Requirements: DacEasy Instant Accounting requires 512K RAM, Hard Disk, DOS 3.1 or later (1 MB RAM, Windows 3.0 or later for Windows Version). Instant Rolodex Requires 1 MB RAM, DOS 3.1 or later, Windows 3.0 or Later. DacEasy, Inc. 17950 Preston Road, Suite 800, Dallas, 75252. All product names are trademarked by there respective corporations. ©1993 DacEasy, Inc. All Rights Reserved

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Circle 109 on reader service card.

Toshiba's Notebook Twins: The Budget Option or Upscale Color?

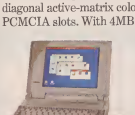
T4600C, T1900C. LIST PRICES UNAVAILABLE. TOSHIBA AMERICA INFORMATION SYSTEMS P.O. BOX 19724 IRVINE, CA 92713-7005 (800) 334-3445

As any frequent flier can attest, Windows notebooks are as commonplace in the friendly skies today as leg cramps and minimeals with mystery entrees.

Toshiba's new high-end/low-end color notebook duo, the T4600C and the T1900C, remove the last impediments to your in-flight enjoyment of color spreadsheets and memos. They're fast, they're small, and they offer enough memory and storage to signal the end of the era of bulky laptops for graphics-heavy jobs such as customer demos.

Near look-alikes, both weigh in at 6.9 pounds (under 8 pounds with a power adapter) and measure 8.4 by 11.7 inches. The T4600C is slimmer at 2 inches high, and both are Windows-ready with DOS 6.0, Windows 3.1, and a Ballpoint trackball. The pair offer different processors, prices, and displays.

One of the first portables to employ a 3.3-volt processor and memory and other subsystems, the T4600C is the 486SL/33 successor to Toshiba's 486SX/20-equipped T4500C. Like the T4500C, the T4600C is sold through MicroAge and similar value-added resellers. But unlike its predecessor, it has a 9.5-inch-diagonal active-matrix color screen and two PCMCIA slots. With 4MB of memory and a 120MB hard drive, the T4600C should sell for about $4,200 on the street.

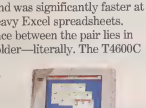


Toshiba T4600C

The T1900C also sports the 3.3-volt implementation of Intel's 486SX/20 chip, and like the 386SX/25-based T1800C, it will be sold at mass-merchant outlets like CompUSA and Computer City. With 4MB of memory and a 120MB hard drive, it should have a street price of about $2,800.

The T4600C's 33MHz 486SL processor performs any function at least 65 percent faster than a 486SX right out of the gate. But because the SL processor also is equipped with an onboard math coprocessor, the T4600C is especially adept at number crunching or any graphics-intensive Windows task. The T4600C sped through our mixed-task Word for Windows benchmark tests several times faster than the T1900C and was significantly faster at crunching chart-heavy Excel spreadsheets.

The key difference between the pair lies in the eye of the beholder—literally. The T4600C has an ultrabright active-matrix color screen that displays 256 colors at 640-by-480-pixel resolution, while the T1900C sports Toshiba's Dynamic STN-Color passive-matrix LCD. You still get a bright 16 colors at 640 by 480 with the T1900C—adequate for all uses except, perhaps, large-group demos.



Toshiba T1900C

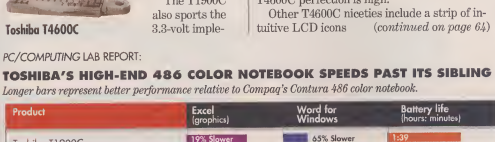
The T4600C display is clearly visible from nearly any angle and offers high contrast. But under normal workaday conditions, you will be perfectly happy with the passive-matrix T1900C. Besides, the price premium for T4600C perfection is high.

Other T4600C niceties include a strip of intuitive LCD icons *(continued on page 64)*

PC/COMPUTING LAB REPORT:

TOSHIBA'S HIGH-END 486 COLOR NOTEBOOK SPEEDS PAST ITS SIBLING

Longer bars represent better performance relative to Compaq's Contura 486 color notebook.



PARADOX IN TWO HOURS

Usobility morches on. The best new usobility ideo we've seen recently is Borlond's (800-551-8188) ultrothorough Learn Poradox for Windows video. Spend o couple of hours with this video, ond you won't just moster o rondom set of triviol features, you'll be fully prepared to build powerful Porodox opplicotions.

The $49.95 tutoriol is extremely well orgo-nized. After o brief conceptuol introduction to the progrom, you hop right into creating tobles, forms, multitoble forms, ond reports. You even get o disk full of somple tobles and other dato to work with os you learn. By the end of the video, you'll be oble to build complex queries ond quickly restructure forms ond tobles. Also included is o short, orgonized manuol thot wolks you through the moteriol in the video. We found that one trip through the video isn't quite enough to moster Porodox for Windows, but some extro time spent with the minimonuol does the job. Thumbs up.

SEBASTIAN RUPLEY

Wake up and smell

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HEWLETT PACKARD

CHAT WHILE YOU WAIT

Tired of twiddling your thumbs during file transfers? PowerLine from Enable Software (800-888-0684) lets you chat while you transfer files.



The $149 PowerLine doesn't include the heavyduty network and terminal-emulation capabilities required for some communications tasks, but it does include PowerLink, a nifty two-way remote-file-transfer facility. PowerLink's chat mode enables you to exchange messages with the operator of a remote computer while you transfer files.

The product includes a reasonably powerful script language. You can easily set up its toolbar to run any menu command, but setting up buttons to run scripts is tricky.

This neat little communications package is made uniquely useful by its chat mode. We're impressed.

DAVID HASKIN

TOSHIBA, *from page 61*

that instantly give you the status of your battery's reserve, the amount of power management implemented, and various other settings such as for the screen blanker.

Toshiba claims that the T4600C's nickel–metal hydride battery delivers 3 hours of uninterrupted computing. In our tests, running full tilt with a fully lit screen, it delivered about 1 hour and 45 minutes. The T1900C had a slightly shorter life under those conditions, although it's rated by Toshiba to give at least 2 hours of battery operation. Both let you swap in a spare battery, which gives enough power to last throughout a cross-country flight.

Since either notebook has more than enough power and storage to run Windows well, your preference will depend on your sensitivity to price and screen quality. The T4600C is for the power user who needs the best desktop presentation tool in the smallest form factor available. The T1900C will please traveling salespeople and others on the go who are willing to trade extra power for a savings of several hundred bucks. Both systems give you great color.

MIKE HOGAN

Eclipse Find 1.0: Fast, Cheap Text Retrieval

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(800) 452-0120
(312) 541-0260

SEARCHING YOUR HARD disk for text-based information is like panning for gold: It can take a long time to find anything of value. You'll find information faster with Eclipse Find for Windows from Eclipse Systems.

Eclipse Find is an indexed text-search utility that resembles Magellan, the cult-classic DOS search utility from Lotus. Unlike text-retrieval utilities such as Norton Desktop's SuperFind, which painstakingly search through documents one word at a time, Eclipse Find uses indexing to quickly sift through files.

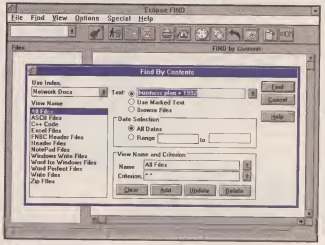
If you think SuperFind and its nonindexing ilk are too slow, but you don't want the expense and complexity of other indexed search products such as ZyLab's ZyIndex, you'll welcome Eclipse Find. In our tests, Eclipse Find was more than twice as fast as SuperFind at searching through 140 text files that occupied 2.3MB of disk space. It was only marginally slower than ZyIndex, the renowned speed merchant in the indexed text-retrieval field.

The downside to the indexing method of searching is that the index files hog disk space. In Eclipse Find's defense, the program's indexing scheme takes a smart approach to using disk space: It limits the size of index files to about 10 percent of the size of your data files. You also must update them periodically, although you can automate this process by having indexes updated in the background at specified intervals.

Eclipse Find includes a basic toolbar, allows you to search by file-creation date, and shows the results of your searches on a calendar (helpful for culling outdated files). Also handy is the ability to search only documents you already have found. However, we sorely missed support for more advanced kinds of searching such as proximity searching, which enables you to search for words that are within a certain distance of other words.

Eclipse Find is fast, inexpensive, and easy to use. There's still no perfect file-retrieval utility, but at $119, Eclipse Find is worth adding to your Windows desktop.

DAVID HASKIN



Eclipse Find 1.0 builds indexes of data files first, and then it searches for the text strings that you specify.



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PC Computing, May 1993

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Circle 127 on reader service card.

Attention CD-ROM Owners: Make Your Drive Run 28 Times Faster

WORDS FOR WORD

If your WinWard isn't wordy enaugh, try the $69.95 Micrasoft Word Camprehensive Spelling Dictionary and $39.95 Micrasaft Ward Campre-hensive Thesaurus fram Alki Saftware (800-669-9673). The products add more than 74,000 new wards to the Micrasoft Ward far Windaws spell-checker and triple the number af keywords and synanyms in its thesau-rus. Bath add-ans were developed by Micrasaft, but when the software giant declined ta market them, Alki distributed them itself.

The new files together require about 1.5MB. The additions dan't change the standard interface af WinWard's spell-checker/thesaurus—they just in-crease its scope. If you use difficult and obscure words, yau'll natice the improvement right away. However, you may find that a $100 word sug-gested by the thesaurus (far example, *artiste*) will still be flogged by the spell-checker.

Nanetheless, the mare adventurous a wardsmith you are, the mare yau'll appreciate these products.

CHARLES BERMANT

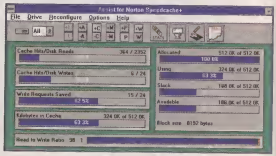
CD-ROM DRIVES ARE slow—about 30 times slower than the average hard drive at many tasks. Now there's a fix. You can make CD searches run lickety-split—while smoothing out that jumpy multimedia video with Lucid Corporation's Lightning CD and Norton's Speedcache Plus 4.0. These two new caches support an array of CD-ROM drives and accel-erate standard disk drive speed as well.

The new breed of CD-ROM caches offers the best of both worlds: They work with CD-ROM drives, and they've got the features and speed to rival the best standard disk caches. We found that they speed up CD-ROM tasks dramatically (see chart).

Using default settings, Lightning slightly edged out Speedcache Plus in the first search test (the test consisted of searching for the word *network*). However, their performance evened out when we ran the test a second time without clearing the cache. We ran a second test for each task because caches are intelli-gent—they remember your last request and retrieve that data directly from RAM instead of from the CD-ROM again.

Our tests showed that Speedcache Plus and Lightning CD each dramatically shortened the time required to open and search Microsoft's Bookshelf for Windows CD-ROM. The prod-ucts also outran Windows' SmartDrive and PC-Kwik by significant margins. We con-cluded that caching doesn't just improve CD-ROM performance, it throws it into overdrive.

Speedcache and Lightning CD, like Smart-Drive, are advanced caches that incorporate



Utilities such as Assist, which lets you configure your cache via a GUI, set Speedcache Plus apart.

read-ahead and write-back caching as well as delayed writes. They also support floppy drives but go beyond SmartDrive in their sup-port of Iomega's Bernoulli drives.

So which one should you get? Performance is about the same. It's the extras that set Norton's Speedcache Plus apart. It uses less conventional memory and contains Windows utilities that allow you to configure many cache settings by simply clicking on buttons. If you're tired of waiting for your CD-ROM drive, Speedcache Plus is your solution.

JOHN TASCHEK

NORTON SPEEDCACHE PLUS 4.0 FOR DOS AND WINDOWS AND CD-ROM, $99
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101 W. RENNER RD., SUITE 450
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PC/COMPUTING LAB REPORTS:

SPEEDCACHE PLUS AND LIGHTNING CD HELP CD-ROMs FLY

Longer bars represent better performance relative to using no cache.

Product	Open Microsoft Bookshelf (test 1)	Open Microsoft Bookshelf (test 2)	Search Microsoft Bookshelf (test 1)	Search Microsoft Bookshelf (test 2)
SmartDrive 4.0	15% Faster	66% Faster	100% (Same)	3% Slower
Lightning CD	50% Faster	400% Faster	210% Faster	2,850% Faster
SpeedCache Plus	50% Faster	400% Faster	168% Faster	2,850% Faster
PC-Kwik	15% Faster	50% Faster	100% (Same)	100% (Same)
No cache	Baseline	Baseline	Baseline	Baseline

Note: The cache was not cleared of data between tests 1 and 2, but it was cleared between the Open and Search tests.

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Horizontal Frequency (KHz)	30-64	30-82	30-82	30-82
1600 x 1280 Non-Interlaced		■	■	■
Maximum Refresh Rate (Hz) at 1280 x 1024 NI	60	76	76	76
Flat Square Screen	■	■		■
ViewMatch™ Color Control	■*	■	■	■
Low Radiation (MPRII)	■	■	■	■

Circle 186 on reader service card.

ViewSonic®

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Tel. (909) 869-7976 Fax (909) 869-7958

ViewSonic 21 screen image by SPATIAL TECHNOLOGY INC., Boulder, CO. Created with **ACIS**® Geometric Modeler and rendered with Vasculification Husk

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Now's your

You wanted the power to choose from a world of different applications. DOS applications. Windows™ applications. OS/2® applications. OS/2 2.0 gave you the power. And the response was impressive, to say the least. Over two million copies shipped in less than one year. More than 1,200 OS/2 applications already available. But now you want more. More features. More functions. More applications to choose from. That's why we're introducing OS/2 2.1.

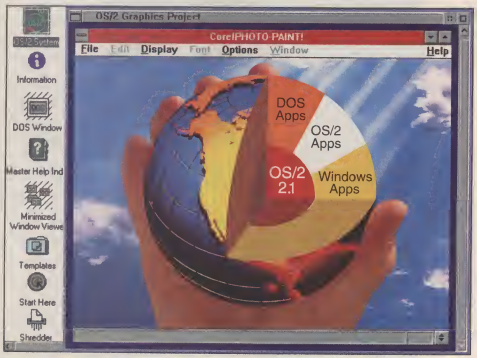
The new OS/2 2.1 lets you run the latest Windows 3.1 applications, in addition to the DOS, Windows and OS/2 applications you can already run. We've also added TrueType fonts, select Windows applets, File Manager and support for Windows 3.1 printer and display drivers, including 32-bit seamless SVGA support. And now you can start DOS and OS/2 applications from a WIN-OS/2 session, too.

Portable users will be glad to know that OS/2 2.1 provides industry-standard Advanced Power Management (APM) support, to help extend battery life. We've made the cursor larger so it easier to find your place on the screen. And OS/2 2.1 continues to exploit the very latest in technology. You'll find improved support for multi-media applications and pen-based capabilities, along with built-in CD-ROM support and AS/400® terminal emulation.



There's no need to buy DOS and Windows to run DOS and Windows applications.

With OS/2 2.1 at the heart of your PC, you can run a world of DOS, Windows and OS/2 applications.



Of course, OS/2 2.1 still gives you true pre-emptive multitasking, superior OS/2 Crash Protection™ and the easy-to-use object-oriented Workplace Shell™ interface. All the features that made Version 2.0 an award-winner. But now, you also get a whole new world of possibilities.

Introducing Version 2.1



chance to run the world.

OS/2 2.1 is now also available on CD-ROM. It comes with exciting multimedia samplers, full-motion video demos and more.

Demand OS/2 2.1 preloaded on your next PC.

With our free demo diskette, you can find out even more about all the powerful features OS/2 2.1 has to offer. For your copy, to find out more about OS/2 2.1, or to order, call **1 800 3-IBM-OS2.** In Canada, call **1 800 465-7999.**



Call for your free demo diskette.

Operate at a higher level.℠

OS/2 2.1 Advantages

Improves productivity
- Now runs OS/2, DOS and new Windows 3.1 applications.
- New TrueType fonts, Windows applets, File Manager.
- Advanced Power Management (APM) support extends battery life for portables.
- OS/2 Crash Protection and pre-emptive multitasking.

Easy to use
- Now also available on CD-ROM.
- Object-oriented Workplace Shell interface.

Advanced 32-bit architecture
- Seamless SVGA support.
- Fully exploits latest multimedia applications.
- Supports CD-ROM, PCMCIA and pen technologies.

*To order CD-ROM with list of OS/2 applications, call Walnut Creek at 1 800 786-9907. IBM, AS/400, OS/2 are registered trademarks, OS/2 Crash Protection and Workplace Shell are trademarks, and "Operate at a higher level" is a service mark of International Business Machines Corporation. Windows is a trademark of Microsoft Corporation. TrueType is a trademark of Apple Computer, Inc. ©1993 IBM Corp.

IBM®

Logitech's FotoMan Plus Camera Now Snaps a Sharper Image

MORE DETAIL

Comeros oren't whot they used to be—not even digitol ones. The old FotoMon's pictures hod resolutions of 376 by 284 pixels, which mode for the murky imoge



seen in the upper output somple here. FotoMon Plus, the new model, offers o resolution of 496 by 360 pixels, which meons you'll see o lot more detoil. The lower output somple is sharper, with much better controst. Best of oll, the murky look is gone. You con snop ond store up to 32 images ot any one time with FotoMon Plus.

FOTOMAN PLUS, $799
LOGITECH
6505 KAISER DR
FREMONT, CA 94555
(800) 231-7717
(510) 795-8500

CAMERAS AND COMPUTERS are much more than kissing cousins now. There are countless ways to bring photographs into a PC—scanners, Kodak PhotoCD discs, and video-capture boards, to name a few—but none is as direct as FotoMan, Logitech's equivalent of a high-tech Instamatic. Operating as a point-and-shoot digital camera, FotoMan snaps digital "photographs" and then saves them to your PC for use with newsletters, databases, or other documents. The latest version, the $799 FotoMan Plus, dramatically improves on the original camera—which earned a *PC/Computing* MVP award in 1991—by offering higher image resolution (see samples at left), longer battery life, and other features that make the technology more provocative than ever.

It's Totable

No bigger than a cellular phone and weighing a mere 10 ounces, the slate-gray FotoMan Plus works like the old Brownie camera. Just find your subject in the camera's viewfinder and press the button, and it captures a grayscale photo. FotoMan's 65mm lens requires no focusing; and its built-in flash goes off automatically in dim lighting. Instead of recording images to film, FotoMan stores grayscale snapshots (up to 32 at a time) in a bank of memory chips inside the camera.

"Developing" the pictures entails connecting FotoMan to a PC via a serial cable. FotoMan's Windows software automatically generates thumbnail views of the images in the camera (similar to a photographer's contact sheet), so you can select only the images you want to keep. Saved to disk as TIF, PCX, BMP, or EPS files, each image requires roughly between 150K to 220K of disk space, but we were able to squeeze a 160K file down to under 20K with JPEG compression. You can use the photos as they appear or retouch them with Logitech's included image editor/digital darkroom, FotoTouch for Windows.

Make no mistake, FotoMan's snapshots don't rival what you get from film—the contrast is low, and whites tend toward grays, especially with photos taken indoors; they're snapshots, not high-quality prints. But the results are as good as what you'll get from scanning a photograph with a standard flatbed scanner, and the process is much quicker. Logitech boosted the resolution on the FotoMan Plus from 376 by 284 pixels to 496 by 360, so the camera captures more detail, and images reproduce better than with FotoMan.

FotoMan Plus runs off internal rechargeable NiCad batteries that hold their charge for as long as 100 hours (a huge improvement over the original FotoMan's 36-hour capacity). When the camera batteries go, however, so do the images stored in the camera, so you can't stray from an AC outlet for too long.

FotoMan Plus won't have you framing masterpieces, and it can't produce color shots—Kodak's PhotoCD technology is your best bet for bringing high-quality 24-bit-color photos into your PC. But for capturing digital snapshots, FotoMan Plus is a cool little gadget and a real boon for desktop publishers. We can't wait until it's as common (and affordable) as a PC mouse.

WENDY TAYLOR



FotoMon Plus, the high-tech equivolent of an Instomatic comera, is obout the size of o cellular phone.

if you've put off getting organized, we've finally come around to your way of thinking.

NOW shipping version 5.0

©1993 Polaris Software. Windows is a trademark of Microsoft Corporation.

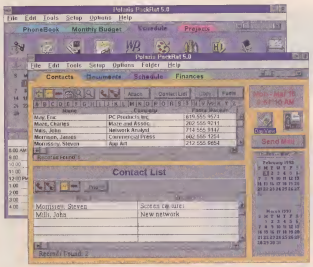
The trouble with getting organized is people don't know where to start. Start with PackRat 5.0.

PackRat 5.0 is the first software to harness the power of the personal computer to integrate all the big ideas and critical details that make the difference between order and chaos in your busy day.

Here's how it works: Instead of your computer being application driven, PackRat 5.0 makes it *activity* driven. Segmented in customizable file folders. Organized by your priorities. Structured the way you think and work.

PackRat becomes the hub of all PC activity, integrating everything you do. PackRat takes charge of your phone book and calendars, your to-do lists and meeting notes, your finances and your correspondence. It will sort out schedule conflicts, dial your phone, update your priorities and issue reports. And that's just for starters.





Design and label folders according to your workstyle for quick, easy access to the Windows applications and tools you need most.

Hey, isn't this what you got a PC for in the first place?

For a free brochure, call:
1-800-PACKRAT, x 5 6 5

Circle 105 on reader service card.

POLARIS SOFTWARE

SLICK LOGITECH SOUND CARD

Transform your beeping R2D2 of a PC into Povarotti. The SoundMan 16 from Logitech (510-795-8500) has 20-voice stereo sound and 44KHz sampling.

The 16-bit card can handle stereo input from a CD-ROM drive, a CD



player, or a MIDI-compatible synthesizer, among other devices. Adding sound to Windows 3.1 documents is easy with Windows' own Sound Recorder. SoundMan 16 lets you record at lower sampling rates to reduce the size of space-greedy sound files. And the card is compatible with Sound Blaster and AdLib. We tested it with all kinds of apps, and it worked flawlessly.

Best of all: SoundMan 16's price of $289 is reasonable for 16-bit sound and cheaper than Creative Labs' and Media Vision's offerings.

LYDIA LEE

Niscan Page: OCR, Grayscale Scans, and Fax Input—To Go

NISCAN PAGE, $799
NISCA
1919 OLD DENTON RD., SUITE 104
CARROLLTON, TX 75006
(800) 466-9096
(214) 242-9696

CONVENTIONAL WISdom says that scanners are tough to install, tougher to share among PCs, and downright impossible to take on the road. The scanner's reliance on jumper-laden interface cards has made it strictly a single-user desktop device. That's not the case with the Niscan Page, a compact sheet-fed scanner that plugs into your parallel port and runs off its own batteries.

Smaller and lighter than a portable printer, this one-of-a-kind $799 grayscale scanner pulls sheets of paper of any size, from business cards to legal-size paper, through its sheet-feed mechanism, registering up to 256 shades of gray at 400 dots per inch. If you're trying to scan bound material, you detach the scan head from its base and use it as a hand scanner—albeit a cumbersome one.

Like any scanner worth buying, the Niscan Page supports the popular TWAIN scanning standard via a scanning utility that's called up directly from any TWAIN-compliant software (a roster that includes most OCR and paint programs). The scanner's own TWAIN software is a three-function application called Words&Pictures that handles grayscale image editing, OCR, and fax scanning (assuming you have your own fax board). Words&Pictures' OCR module uses a recognition engine based on OCRon's Perceive software, which does a respectable though not outstanding job of recognition on a range of printed material. The fax software module seamlessly primes your fax modem with whatever image you've scanned and even enables you to scan images directly to a printer—making your system an ersatz photocopier.

The weakest link in the software is its grayscale image editor, a funky, bare-bones module that lacks such basics as a File, Exit menu option. Anyone serious about image editing should use other TWAIN-compliant software instead of the Words&Pictures product. Other niggling problems mar the product's usability. Incomplete setup procedures and confusing documentation belie the promise of easy installation.

However, once you've set up the Niscan Page's TWAIN source and software, it runs like a charm for up to 30 pages on a fully charged battery (fewer pages if it's scanning bound material)—and it runs indefinitely if it's plugged in. Its TWAIN support means that if you don't like Words&Pictures, you can opt for a TWAIN-compliant replacement. Finally, you've got a workable way to take your scanning station on the road.

MATTHEW LAKE



The eminently portable Niscan Page scanner simply plugs into a parallel port—there's no cord to insert.

XTree for Windows: A Slimmed-Down Windows Shell

XTREE FOR WINDOWS 1.5, $99
XTREE
4115 BROAD ST., BLDG. 1
SAN LUIS OBISPO, CA 93401-7993
(800) 388-3949

SMALLER IS DEFInitely better—at least when it comes to Windows shells. And XTree for Windows 1.5 stuffs more functionality into less disk space than any robust Windows file launcher or shell we've seen. Symantec's Norton Desktop for Windows 2.11, for example, requires 11MB of disk space, while XTree for Windows requires just 5MB.

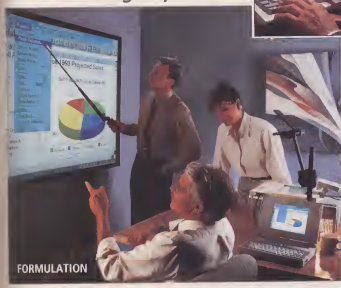
XTree is best known for its file-management prowess, but the biggest star of this upgrade is the Command Center. The building blocks of the Command Center are CommandBars, which are button bars for launching applications, files, and

(*continued on page 74*)

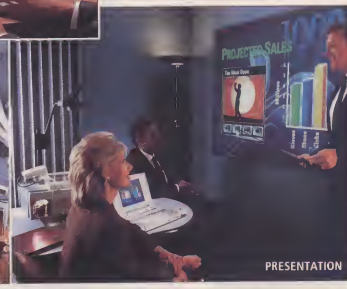
From Your Desktop...



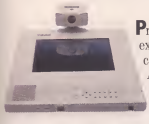
To The Workgroup...



To The Boardroom...



Proxima® brings the power of your computer to the meeting room.



Proxima LCD projection products extend the reach of your desktop computer into the meeting room. And that means fewer, more productive meetings! Using the tools and data you already have at your desk, you can project precisely the same images you see on your computer screen. In brillant color. For all to see.

Desktop Projection™

Think of it as "Desktop Projection"—the link between your computer and the workgroup. Desktop Projection lets you focus everyone's attention on the large screen. A Desktop Projection solution allows the entire group to explore "what-if" scenarios, perform on-the-spot problem solving, or fine tune ideas in brainstorming sessions.



And once you have formulated your concepts in the workgroup, you can present them at meetings, training sessions, or boardroom presentations. You can even augment presentations with video by connecting a video source, such as a VCR or laserdisc, to a Proxima projection system.

It's all so easy!

Just plug the Proxima LCD projection product into the video port of your IBM® PC or compatible or Apple® Macintosh®. Your presentation, project management, spreadsheet, or multimedia software is now on-line—without the need for flip charts, 35-mm slides, or overhead transparencies.



Just set the panel on an overhead projector.

And with Proxima's unique Cyclops™ pointer system, you get all the capabilities of a cordless mouse—and more. Simply touch the wand to your projection screen, point and click to control your computer right at the projected image. With Cyclops, you will add an element of magic and excitement that will captivate your audience!

Whether your meeting is in a conference room, classroom, or auditorium, Proxima has a Desktop Projection solution to meet your needs. To find out more about Desktop Projection and how to run more effective meetings, call our toll free number today.

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DINOSAURS ON DISK

Tyrannosaurus rex lives again. Computer Suppart Carparation's (214-661-8960) Arts and Letters Jurassic Art combines a clip-art library filled with dinasaur images, a slick hypertext "dinasaur da-

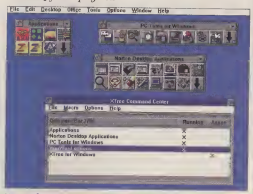


tabase," and an easy-to-use drawing program.

The drawing program is a scaled-dawn versian af the standalane Arts and Letters applicatian, but its graphics taals are saphisticated. They include a large gallery af special effects that makes it easy ta custamize the clip-art. Our favarite feature is a series af skeletans that you can take apart and rearrange bane by bane. A drawback: Taa many af the dinasaur images are mere silhauettes.

At $59.95, Jurassic Art is still a cheap way ta add prehistaric panache ta your dacuments. DYLAN TWENEY

XTREE, *from page 72*



XTree far Windaws 1.5's Cammand Center lets you reconfigure button bars and create macras.

macros. For Windows minimalists, these button bars are sophisticated enough to replace Program Manager.

You can set button bars so that they always appear, or you can specify that they appear only with specific programs—a useful feature if you have application-specific needs. You can alter the size of buttons and either anchor button bars to a specific spot on the screen or allow them to remain where you last put them.

The Command Center itself resembles Windows' Task Manager and allows you to load and configure button bars, create macros, and launch programs from the command line.

Unlike the barely functional Windows Recorder utility, XTree's macro recorder registers mouse actions in macros. While it is not as flexible as ProKey for Windows—a dedicated macro-recording utility—XTree includes a powerful and complex macro language.

Version 1.5 supports Windows for Workgroups and lets you drag files to button bars or your desktop. Another popular feature is the ability to create and manage compressed file sets directly from the file list window.

If conserving a few megabytes of disk space is an issue—as it is for many notebook users—XTree for Windows is the best choice in Windows utilities. **DAVID HASKIN**

Digicom's Connection 96 Plus: Is It Really the Last Modem You'll Ever Install?

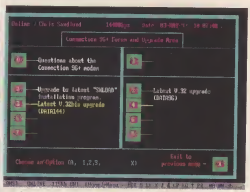
CONNECTION 96 PLUS, $199
DIGICOM SYSTEMS
188 TOPAZ ST.
MILPITAS, CA 95035
(800) 833-8900

With Digicom Systems' $199 Connection 96 Plus, upgrading your modem just became as easy as dialing your telephone.

Traditional modems use chip sets from companies like Rockwell International to encode and decipher signals over your phone line. If a better chip set is developed, you have to buy a new modem to get it. Digicom's SoftModem technology has taken that intelligence out of the chips and loaded it onto your hard disk. When you start your computer, you automatically load the digital signal processor (DSP) on the Connection 96 Plus's internal board—turning it into a 9,600-bit-per-second modem.

We downloaded the 14,400-bps V.32bis upgrade from Digicom's BBS, put it into the subdirectory holding Digicom files, changed the name of the modem file that AUTOEXEC.BAT loads at startup, and rebooted—and the same Connection 96 Plus card was operating at 14,400 bps.

Upgrades for V.42bis error correction are free, and upgrades for send/receive fax capabilities should be available soon—priced at around $60. The current Connection 96 Plus board can handle all Digicom's planned upgrades through V.Fast (19,200 bps). Even though modem prices are tumbling, we couldn't find a 14,400-bps modem priced under $199 list. Even if they exist, they won't include a $60 software upgrade for send/receive fax capability. With its SoftModem technology, the Connection 96 Plus has smashed technology barriers as well as price barriers. **CHRIS SANDLUND**



With the Cannection 96 Plus, upgrading ta V.32bis is as simple as dawnloading fram Digicam's BBS.

RECENTLY,
SOME HAVE REFERRED
TO LOTUS 1-2-3
AS SOMETHING OF
A SLEEPING GIANT.

LOTUS INTRODUCES 1-2-3 RELEASE 4 FOR WINDOWS.

THIS IS CLEARLY A TIME OF CHANGE FOR AMERICAN BUSINESSES.

To keep up with these changes, and the new ways of working they demand, business people need new and better-suited tools. Lotus® has responded by rethinking and re-creating the spreadsheet as a tool for individuals and for workgroups. 1-2-3 Release 4 incorporates over 4,000 spreadsheet user suggestions. It's dramatically easier to learn and use than any spreadsheet in history. It's much more powerful and productive. And it's the first spreadsheet that's actually designed to help people work together in impressive new ways.



sheet, it's a significant advance over Microsoft® Excel in usability.

THE FIRST CONTEXT-SENSITIVE USER INTERFACE.

Release 4 actually anticipates what tools and functions you'll need. Depending on what you're doing, 1-2-3 presents only the menu choices and **SmartIcon**™ palettes appropriate to the operation at hand.

Since the features you need are always easy to find and remember, you won't spend time clicking

FEE. FI. F

IT'S MORE POWERFUL BUT VERY SIMPLE.

While adding dozens of major new features, hundreds of macros and hundreds of tools and @ functions, Lotus has actually simplified the way you work in a spreadsheet.

For example, Release 4 features an @ function pull-down menu to help you build spreadsheets faster. Cell copying is now a simple drag-and-drop operation, with meaningful visual feedback. And changing text and font attributes is done in one dialog box. (Excel often requires three.) So 1-2-3® is not only a lot friendlier and easier to use than any other spreadsheet.

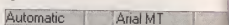


The open-handed mouse pointer closes when you grab the cell.

through menus looking for them. They're where you want them when you need them.

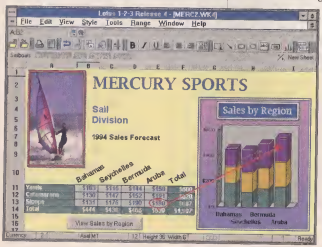
IMMEDIATE ON-SCREEN MANIPULATION.

A **Live Status Bar** on screen shows the attributes of any highlighted element.



To make a change (like font, size or decimal points) you just click on the appropriate section of the status bar. Then scroll up to your chosen attribute and click again.

And unlike Excel, 1-2-3 R 4 includes **In-Cell™ Editing,** so you can

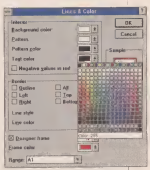


literally work in your spreadsheet. There's no need to go to the control panel. You can enter and edit any information right in the cell.

And you can go directly to any named range on any page simply by clicking on the name in the exclusive **Navigator** menu.

ONE-STEP CHARTING.

With **One-Step Charting,** you can pick up all titles, data, legends and axis labels right from the worksheet to create a great looking chart the first time, automatically. No need to launch into some five step, semi-connected charting wizardry with its own set of commands just to edit a simple chart. And you can edit the chart right in your worksheet because all elements can easily be selected and manipulated directly. And you can even choose from 256 colors.



12 Height 14 Width 9

NAVIGATE THROUGH 3 DIMENSIONS.

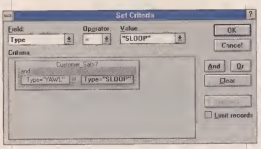
Anyone who works on multiple worksheets will appreciate the new 1-2-3 **Worksheet Tabs** which can be labeled with real words. So you can go directly to any sheet simply by clicking on the appropriate tab.



And Worksheet Tab names are then incorporated into formulas. All of which helps to keep 1-2-3's unique 3D technology simple and easy to use.

DATABASE FUNCTIONS MADE EASY.

The 1-2-3 database now has a new, completely graphical interface that makes using it significantly easier. Plus 1-2-3 provides a range of built-in tools that are powerful without being perplexing.



For example, to modify or create a query, you don't generate criteria and output ranges with cryptic commands. Just bring up the Query Dialog Box and select the fields and records by name. Changing your query is as simple as drag-and-drop.

With DataLens® drivers for dBase IV,® SQL Server, Informix, OS/2® Data Manager, Paradox® and more (including ODBC support), 1-2-3 is the first spreadsheet that provides a completely integrated model for directly querying both on-sheet and external databases.

THE SMOOTHEST PATH FROM DOS TO WINDOWS.

If you're ready to make the move from DOS to Windows,™ 1-2-3 Release 4 is the way. It includes the traditional 1-2-3 ('/') **Classic® Menu** as well as complete file, style and macro compatibility with your DOS version.

And if you're networked, just turn the page and you'll see why the best spreadsheet for you is the only spreadsheet for your workgroup.

O. FUM.

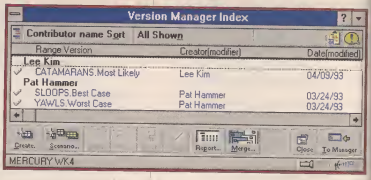
THE FIRST SPREADSHEET FOR WORKGROUPS.



With 1-2-3 Release 4, Lotus transforms the spreadsheet into the powerful workgroup tool people have needed.

integrate it into your work?

You use our innovative **Version Manager**, that's how. Version Manager tells you who did what when, and why they did it. It lets you save, label, track, mix, match, merge and comment on ranges, worksheets or entire files in ways that make sense to you. And it does it all without overwriting existing data.



In fact, whenever a new version is created, 1-2-3 automatically "stamps" the version with the user's name and the date and time it was created.

1-2-3 MEETS LOTUS NOTES. TOGETHER, THEY CHANGE EVERYTHING.

This is the way people ultimately want to work. Not just together. Concurrently.

If you have Lotus Notes,® the workgroup benefits of the new 1-2-3 take on even greater proportions. Besides utilizing the impressive workgroup power of Notes, there are specific Release 4 features that synergize to offer significant business advantages. Here are just a few.

Now different users can access and work on the same spreadsheet at the same time. Notes maintains file integrity and notifies you of changes made by others. So you know you're using the right numbers.

Notes also features replication. This means that even if you're disconnected from the network while you travel, you can stay up-to-date and still participate fully in the spreadsheet sharing process



IT'S NOT JUST A NEW VE

Combining the analytical power of 1-2-3 with workgroup features, users can now share spreadsheet insights and information and collaborate in ways never before possible.

VERSION MANAGER MAKES WORKGROUPS MAKE SENSE.

Ever forgotten why you used a particular number? Or wanted to track more than one value in a cell or range? Or suppose you've sent a spreadsheet to a co-worker who develops a whole new version and sends it back. How do you

when you reconnect.

To maintain security and integrity, users can create access lists and grant varying privilege levels on a per-user basis.

And all this comes standard as part of the new 1-2-3 Release 4. No add-ons, customizations or new application development is necessary.

WORKING TOGETHER IN SUPPORT OF INDUSTRY STANDARDS.

1-2-3 R 4 supports object-linking and embedding technology for both clients and servers. This enables users to display data from a 1-2-3 spreadsheet into any OLE client application such as a word processor or presentation software. 1-2-3 also complies with VIM and MAPI standards so it works with cc:Mail,™ Lotus Notes or any other VIM- or MAPI-compliant mail system installed on your computer. So you can send a worksheet, a range or an entire file as an e-mail message to another user.

All without ever having to leave 1-2-3.

A FEW OF THE SPREADSHEET ENHANCEMENTS REQUESTED BY OUR USERS.

120 new @ functions (engineering, statistical, financial, calendar, informational, mathematical)
16 Designer Frames
256 color choices
64 fill pattern choices
250 new macro commands
Animated tutorial
AutoSave option
Center text over a range
Charting of 23 data points
Clean screen elements
Column, row and worksheet selection
Cross Tab
Customizable data fill
Define column aliases for database queries
Discontiguous range selection and charting
Displays up to five most recently opened files
Easier computed columns and rows
Enhanced Help system
Enhanced macro transcript
Escape from Help
External connections stored with query
Fill down, fill right
Floating, wrapping text boxes on sheet
Gradient fills
Group draw items
Help icon in dialog boxes
Icons in page setup
Interactive print preview
Justify labels and values left, right, center
Keyboard shortcuts
Long prompt text feedback in title bar
Lotus shared dialog box editor
Macro buttons on sheet
Named SmartIcon sets
New chart types
Numeric format WYSBYGI dialog box
Numeric up/down "clicker" on number fields
Partial insert/delete of rows and columns
Post selection from all range controls
Pre-built dialog boxes for application development
Print range stored in print settings
Print to fit columns
Print to fit rows
Print to fit page
Print to fit chart
Print charts directly
QuickMenus (context-sensitive right mouse-button menus)
Reads XLS spreadsheet files
Rotate cell contents up to 90 degrees
(Send-SQL) macro command
Shared dictionaries (across Lotus apps.)
Shows file links in dialog box
SmartIcon bitmap editor
Spell checker
Style gallery containing predefined style templates
Text wrap in edit line
True on-sheet draw layer
Vertically centers text within a cell
Windows-common dialog boxes
Wraps multiline text in a cell
"+" or "=" sign to start a formula automatically
Converts to "@" formula
@ function arguments supplied
(A more detailed list available on request.)

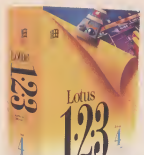
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Lotus. 1-2-3 Release 4
SPREADSHEET FOR WINDOWS



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For the last two years, Lotus Freelance Graphics® has dominated both Harvard Graphics® and PowerPoint® for power as well as ease of use.

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Lotus Organizer™ is rated best in the PIM category.

And Lotus Notes is the talk of the industry, redefining workgroup computing in practical ways that upgrade vital business processes.

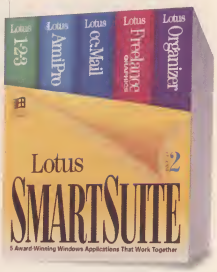
All these Lotus Windows applications look, feel and work together like they were made for each other. Because they were. With only one user interface to learn. Common SmartIcons that work across applications. Seamless transport of data and charts between applications. And one spell-check dictionary that works across these applications.

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Lotus 1-2-3 Release 4
SPREADSHEET FOR WINDOWS

*In Canada call **1-800-GO-LOTUS.** Please have your credit card and product package ready when you call. **Offer good 6/10/93–8/31/93 or while supplies last. Qualifying competitive products are: Microsoft Excel, Borland Quattro Pro (not including SE), Microsoft Word, WordPerfect, WordStar, Displaywrite, Microsoft PowerPoint, Harvard Graphics, Corel Draw, WordPerfect Presentation, Aldus Persuasion. Qualifying Lotus products include 1-2-3 (excluding 1-2-3 for Home), Symphony, Ami Pro, Freelance Graphics, Graphwriter and cc:Mail.

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U.S. Robotics 14,400 Fax Modem: High Speed for Under $300

SPORTSTER 14,400 FAX, $299
U.S. ROBOTICS
8100 N. MCCORMICK BLVD.
SKOKIE, IL 60076
(800) 342-5877

NOT A DAY goes by when we don't see a new low in high-speed modem prices. Case in point: U.S. Robotics' Sportster 14,400 Fax external modem. With a rock-bottom new price of $299 and the inclusion of a 14,400-bit-per-second fax capability and leading fax software from Delrina, the Sportster balances the price-performance scale nicely.

At this price, there's no reason *not* to move to the faster modem, especially now that public and private data networks support high-speed communications.

We tested the Sportster 14,400 Fax's compatibility with a wide variety of connections, including several CompuServe nodes around the country as well as BBS connections, and found no problems. The modem supports all of the important CCITT international protocols: V.32bis for modulation, V.42 for error control, and V.42bis for data compression.

Besides the fast data-modem component, the Sportster 14,400 Fax includes 14,400-bps fax send-and-receive capabilities. U.S. Robotics has included a copy of WinFax Lite, a trimmer version of the popular WinFax Pro from Delrina.



For $299, U.S. Robotics' new Sportster handles high-speed data and fax transmissions.

If you're looking for an inexpensive modem from a company you can expect to be around tomorrow, look no further. The Sportster is a perfect balance of performance and price.

DALE LEWALLEN

EASY SCSI CONNECTION

Connecting a SCSI device to your PC just got dropdead easy. The $229 MiniSCSI Plus parallel-to-SCSI connector from Trantor Systems (800-872-6867) improves on its predecessor, the MiniSCSI. The new adapter's design builds



parallel-to-SCSI conversion into a cable instead of a back-of-the-system connector. It all happens in one device.

Plug one end into your parallel port and the other end to the SCSI device—you don't need additional cables. Like the MiniSCSI, the Plus includes a parallel port pass-through so you can print while accessing a SCSI drive, without slowing performance. You can daisy-chain up to seven SCSI devices with MiniSCSI Plus.

BRUCE SCHNEIER

Swfte's Utility Prints Right to Letterhead

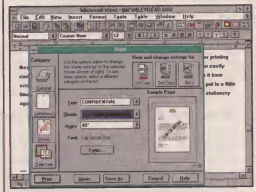
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HOCKESSIN, DE 19707
(800) 237-9383

HAVE YOU EVER put your customized letterhead into a printer and wondered why you couldn't use your PC to create it? If you use Word for Windows, Swfte's Letterhead for Word lets you print customized letterhead just as easily as you would any other document.

You install the program as an option on the WinWord File menu. In addition to printing letterhead, it also allows you to print the faint image of a word across your documents, such as *confidential* or *draft*. It prints up to three different copies of any document, so you could, for example, print one copy with your letterhead for mailing, another for your files with the word *file* across it, and a third for distribution within your company with the word *confidential* on it.

Be aware that this is not a tool for designing letterhead, but for printing it. If you want a truly unique letterhead, you'll have to design it from scratch in WinWord—not always an easy task. Still, after you're done, you'll never need to fuss with paper trays or buy custom letterhead again.

PRESTON GRALLA



Swfte's Letterhead for Word gives you the ability to mark documents *confidential* or *draft*.

Spotlight

Low-Cost IBM Systems

No longer subservient to their predecessors' mainframe and minicomputer mortkeeping plans, the entrepreneurs at the IBM PC Company are celebrating their newfound freedom by revamping the PS/ValuePoints and expanding the service options.

No Micro Channel tomfoolery in these systems—the new ValuePoints are industry standard and share innovative motherboard and subsystem designs that squeeze out all superfluous costs in order to give users what they want most—fast graphics, big hard disks, and upgradable processors at competitive prices.

The smallest and least-expensive ValuePoints are the low-profile **SpaceSaver** systems with three slots and three drive bays; the boys can take 120MB or 245MB hard drives, or they can be configured as diskless LAN nodes. ($1,080 for diskless model with a 14-inch Super VGA color monitor; IBM; 800-772-2227)

The **Desktop** systems contain a different I/O-bus daughtercard in a slightly larger case and come with five ISA slots and five drive bays. ($1,629 with 425SX processor and 120MB hard drive; IBM; 800-772-2227)

The most expandable, but by no means oversized, ValuePoint is the **Mini-Tower;** with eight slots and six drive bays, it doubles as a high-performance workstation or server. ($2,579 with open bays and 433DX processor; IBM; 800-772-2227)

All models feature VESA local-bus graphics on the motherboard, an open VESA VL-Bus slot, 1MB of VRAM expandable to 2MB, an optional 128K or 256K cache, and a zero-insertion-force connector for easy processor upgrades. In addition to the standard one year of onsite service and 24-hour phone support, you can purchase an extended warranty that will cover just the components you choose for whatever length of time you want.

THE LATEST UPGRADES TO PRODUCTS YOU USE

BY MIKE HOGAN

Fastback Plus 6.0

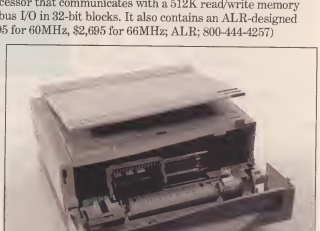
Backing up is hard to do; at least you might think so, judging by how often the practice is avoided. This version of Fastback Plus tries to overcome user inertia with a new, more intuitive interface and a $40 discount on its former suggested retail price. In addition to point-and-click file selection, easier file comparison, and virus protection, you get support for SCSI devices and network tape drives, and even the ability to back up your notebook to your desktop. ($149, $49 for upgrade; Fifth Generation; 800-873-4384)

ProVEISA Pentium Upgrade Module

ALR is offering a system card add-in for its ProVEISA model servers that also works with its discontinued PowerPro servers. The Pentium module fits into any 32-bit EISA slot and includes a 66MHz Pentium processor that communicates with a 512K read/write memory cache in 64-bit words and with bus I/O in 32-bit blocks. It also contains an ALR-designed flash BIOS for upgrades. ($2,395 for 60MHz, $2,695 for 66MHz; ALR; 800-444-4257)

MCMaster

Extend the life and power of your 386SX or 386DX IBM PS/2 with an MCMaster 486SX or 486DX upgrade board. These system-upgrade boards plug into any Micro Channel slot and support an additional 64MB of 32-bit system memory and 128K of cache without sacrificing your current system-memory investment. MCMaster is compatible with PS/2 Models 55 through 95. ($795 for the 486SX/25, $1,095 for the 486DX/33; Kingston Technology; 714-435-2600)



Canon CJ10 Printer/Scanner/Copier Combo

Canon's BubbleJet technology isn't just for printing anymore. Canon has combined its 400-dot-per-inch BubbleJet print engine, a 128-nozzle print head, and specially formulated inks to produce a combination printer/scanner/copier at a remarkably low price. Better yet, the CJ10 yields brochures, flyers, and transparencies in 256 colors. This low-profile unit has an 8½-by-11-inch flat scanning bed and prints or copies color at about 90 seconds per page. ($6,995; Canon U.S.A.; 800-652-2666)

Where in Space is Carmen Sandiego Deluxe?

As a not-so-famous globe-trotting detective, you've finally left the ionosphere in pursuit of the elusive Carmen Sandiego and her gang of spaced-out aliens. In this educational adventure, you pilot your Cosmohopper 911 Turbo where no detective has gone before; you gather clues with the help of your VAL 9000 computer, which also happens to be packed with reams of intergalactic trivia including video clips of planetary flybys. Fun for kids of every species. ($79.95; Broderbund; 415-382-4400)

Microsoft Mail Remote for Windows 3.2

Version 3.2 makes it easier to create Microsoft Mail user accounts during installation with a utility that extracts addresses from existing directories on Novell NetWare and Microsoft LAN Manager networks. User addresses can be moved among post offices just by dragging and dropping. Remote Client for Windows, the first Windows mail package for remote users, lets users read and create messages offline, and schedule automatic dial-ups for times when phone rates are cheaper. ($195 for Mail 3.2, $50 to upgrade, and $2,749 for 20-user license; Microsoft; 800-426-9400)

"What I needed were sales letters with color graphics, a bunch of different typefaces, great print quality, and a little peace and quiet."



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The GSX-240 gives you everything you're looking for in a printer. It's fast, reliable, inexpensive and versatile. With optional Color On Command™ and built-in scalable fonts, the GSX-240 will enhance the looks of any document you create. And with Citizen's patented C.A.T. Citizen Acoustic Technology™ it will do it all, quietly. In fact, the GSX-240 is among the world's quietest printers.

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The Citizen GSX-240. It only prints everything you need.

Circle 214 on reader service card.

Short Takes

Claris's FileMaker Pro 2.0 for Windows is selling for $129 through August 15—reduced from its suggested retail price of $399—while upgrades from competing products are available for $99. ClarisWorks 1.0 for Windows will sell for $99 through August 15, down from $249. (Claris Corp.; 800-544-8554, 408-727-8227)

Great Plains Accounting Version 7.0 has gotten faster and has beefed up its inventory, order-entry, and purchase-order modules. The DOS package also runs more easily on NetWare LANs. ($295 to $1,295 per module; Great Plains; 800-456-0025)

Prodigy, the online computer network, is revamping its pricing structure to more accurately reflect the costs of different features. You can still obtain several hundred Prodigy features for a flat rate of $14.95 a month, including 30 private e-mail messages and two hours of "plus" features. But now you can opt for two hours online with either core or plus features for $7.95 per month. After two hours online, charges accrue and e-mail messages are 25 cents apiece. (Prodigy Services; 800-776-3449)

Pacific Data Products' Pacific DirectNet add-in card will turn your HP LaserJet III or later printer into a network print server accessible by both NetWare and TCP/IP users simultaneously. The print-server card can be updated for future OS versions through its programmable flash memory. ($699; Pacific Data Products; 619-552-0880)

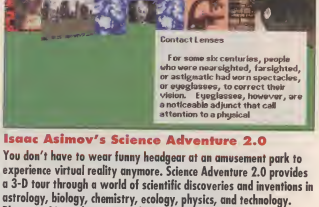
Axcelis's Evolver 2.0 spreadsheet-solver utility lets you optimize your spreadsheet with more control by providing engines that are tuned to a wider variety of problems. For example, you can find the shortest route connecting several locations or uncover the scheduling of conflicting tasks. ($349, $89 for upgrade; Axcelis; 206-632-0885)

Act for Windows 1.1

Version 1.1 of this popular contact manager boosts the performance of many tasks by up to 300 percent, and its price has been slashed by $100. The program interacts better with other software and other Act versions; for example, you can more quickly import dBASE IV and ASCII files, as well as files from popular personal information managers such as PackRat. A quick-dial phone list, an enhanced look-up facility, and links to popular Windows word processors are other new features. ($395, free upgrade for current users; Contact Software Int'l; 800-365-0606)

Personal MacLAN Connect

Now both PC and Macintosh users on ethernet, AppleTalk, and token-ring networks can share files, mail, and printers through Personal MacLAN Connect, a peer-to-peer network operating system that's similar to Microsoft Windows for Workgroups. It can operate on top of NetWare and LANtastic networks, loading itself into 400K of high memory on every participating PC and tapping the built-in personal file-sharing services of Macintosh System 7 for directory synchronization across networks. It offers the usual read-only and read-and-write file- and directory-access privileges. ($199 per user; Miramar Systems; 800-862-2526, 805-966-2432)



Isaac Asimov's Science Adventure 2.0

You don't have to wear funny headgear at an amusement park to experience virtual reality anymore. Science Adventure 2.0 provides a 3-D tour through a world of scientific discoveries and inventions in astrology, biology, chemistry, ecology, physics, and technology. Photographic-quality images, full-motion video, and MIDI sound bring to life various interactive scientific simulations and experiments. ($59.95, $79.95 on CD-ROM; Knowledge Adventure; 800-542-4240)

QuoteLink

Reach out and pull down earnings histories and news stories on your favorite stock picks from popular investment and financial-management programs. QuoteLink is a software front end providing easier access to the Telescan database subscription service. Telescan lets you download daily stock quotes, financial data, and news from leading wire services into Quicken, Managing Your Money, Lotus 1-2-3, Microsoft Excel, and other popular programs used for financial management and investing. In addition, QuoteLink manages up to 450 portfolios, each of which holds 150 stocks; the information is retrieved using both technical and fundamental market-analysis filters. ($29.95, $25 per month for non-prime-time access; Telescan; 800-324-8246)

EZ-NCOA 4.0

Clean mailing lists are an indispensable part of marketing, but keeping addresses up-to-date can turn into a full-time job. EZ-NCOA 4.0 lets you update your list from the United States Postal Service's National Change of Address Center for $7 per 1,000 names. Version 4.0 not only converts mailing lists on disk to the format required by the Postal Service, but it also reconverts the all-uppercase data returned by the Postal Service to the appropriate case for personalized mailing. ($59; Nuts and Bolts Software; 619-942-9692

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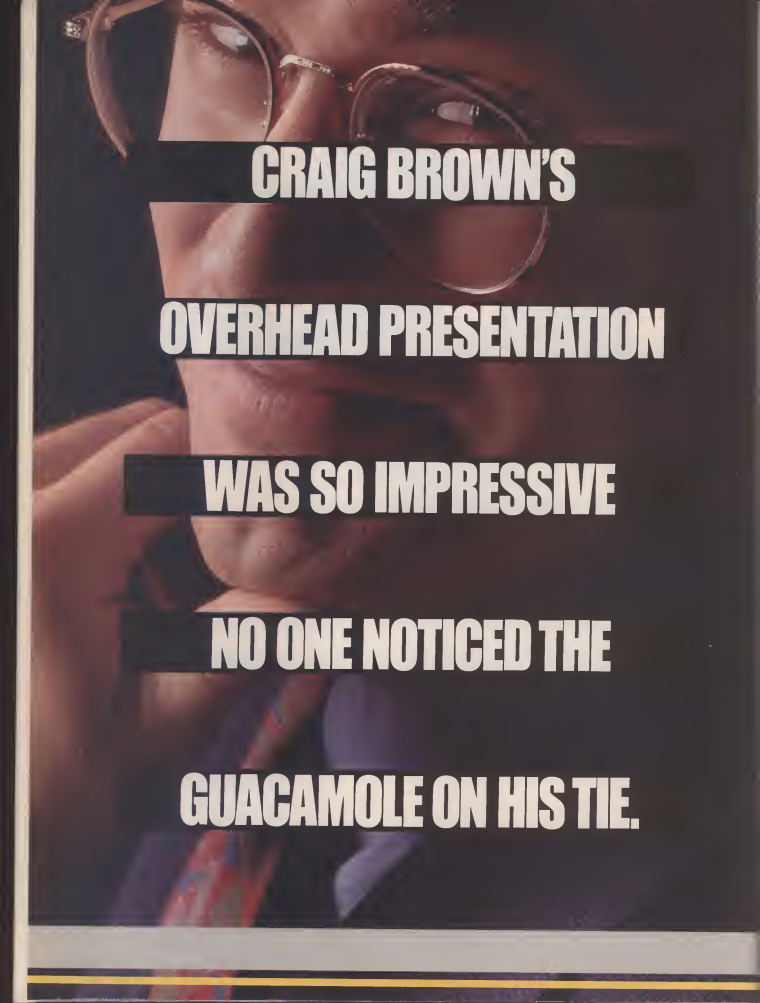
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If you buy a copy of Microsoft Word 6.0 for DOS, you can take advantage of one of the more unusual offers in software: You can also use a copy of Word for Windows 6.0 for free when it ships. (The previous version of Word for Windows was 2.0, but the newest is 6.0. Go figure.) It works like this: If you've bought the DOS version of Word 6.0, you can simply copy someone else's Word for Windows 6.0 for free. If you want your own disks, you can buy them from Microsoft for $15. If you want the documentation, it'll cost an additional $49.50. Call Microsoft at (800) 426-9400.

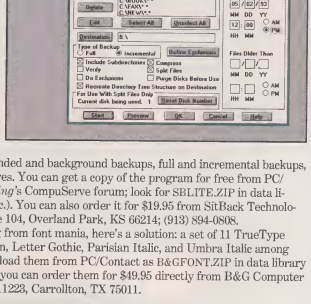
Hayes's Windows Comm Software for Less Than $50

Looking for a solid Windows-based communications package? If you act fast, you can get one—and cheap. Smartcom for Windows from Hayes Microcomputer Products is currently available for $49, but not for much longer. That price holds only until the end of July. After that, you'll have to pay the full freight of $149. Call Hayes at (404) 441-1617 for details.

PCContact

Try TrueType Fonts and Windows Backup Program at No Cost

This month's best bets in try-before-you-buy shareware are a remarkably easy-to-use Windows backup program and a collection of 11 TrueType fonts. SitBack Lite makes backups under Windows a snap—it's one of the most intuitive backup programs around. It features just about everything you'd expect in a backup package, including unattended and background backups, full and incremental backups, and scheduling features. You can get a copy of the program for free from PC/Contact, *PC/Computing*'s CompuServe forum; look for SBLITE.ZIP in data library 3 (Utilities/Misc.). You can also order it for $19.95 from SitBack Technologies, 9290 Bond, Suite 104, Overland Park, KS 66214; (913) 894-0808.



For those suffering from font mania, here's a solution: a set of 11 TrueType fonts, including Caslon, Letter Gothic, Parisian Italic, and Umbra Italic among others. You can download them from PC/Contact as B&GFONT.ZIP in data library 3 (Utilities/Misc.). Or you can order them for $49.95 directly from B&G Computer Solutions, P.O. Box 111223, Carrollton, TX 75011.

BEST SOFTWARE BUYS

Where can you get the best software deal? Usually through the mail. We surveyed mail-order houses and come up with the best prices we could find. The following prices include shipping and handling charges, but don't include credit-card surcharges. Prices are as of press time and are subject to change.

PRODUCT	LIST PRICE	BEST PRICE	SOURCE
DOS 6.0 upgrade	$99.95	$42.00	PC Zone, (800) 252-0386
Excel 4.0	$495.00	$299.00	Software Add-Ons, (800) 695-8088; or Lomo, (800) 369-2846
Lotus 1-2-3 3.4	$595.00	$351.00	Bulldog, (800) 438-6039
Microsoft Word 5.5	$450.00	$207.00	Computer Discount Warehouse, (800) 473-4239
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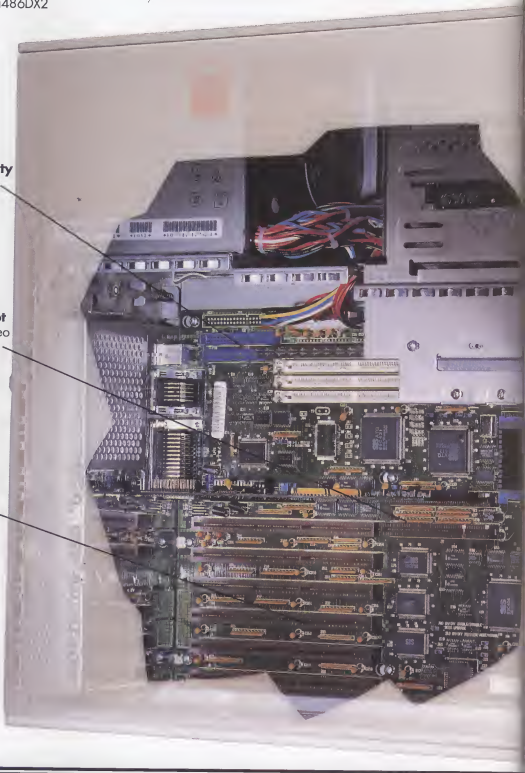
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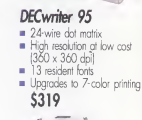
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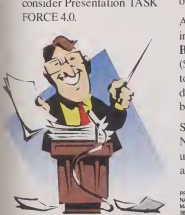
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May	Apr	
1	1	**WORDPERFECT 5.1 FOR DOS** (WordPerfect) The most popular word processor holds its own against the onslaught of fancier Windows programs. $495.
2	2	**WORDPERFECT 5.2 FOR WINDOWS** (WordPerfect) This graphical word processor includes Grammatik V, Adobe Type Manager, and button bars. $495.
3	5	**PARADOX FOR WINDOWS** (Borland) Borland's relational database management system introduces a powerful visual, object-oriented way of working with data. $795.
4	3	**EXCEL 4.0** (Microsoft) Excellent database features and outstanding graphics make this Windows spreadsheet a favorite. $495.
5	6	**MICROSOFT ACCESS** (Microsoft) A friendly yet powerful relational database for Windows; context-sensitive toolbars make application development a snap. $495.
6	13	**QUATTRO PRO FOR WINDOWS** (Borland) This Windows spreadsheet supports all the file formats of its competitors and uses a handy notebook metaphor for organizing worksheets. $495.
7	-	**IMPROV FOR WINDOWS** (Lotus Development) A spreadsheet-analysis program that lets you rearrange, hide, show, collapse, and expand your worksheets using dynamic views. $495.
8	12	**OFFICE FOR WINDOWS** (Microsoft) A business bundle that includes the latest versions of four Windows business applications: Microsoft Excel, Word, PowerPoint, and Microsoft Mail for networks. $750.
9	4	**WINFAX PRO 3.0** (Delrina Corp.) Fax Windows documents from within your applications or annotate received faxes with text or object-based drawing tools. $129.
10	9	**PROCOMM PLUS 2.01** (Datastorm Technologies) This updated DOS communications program includes a companion text editor, password protection, and extensive file transfer capabilities. $129.

Personalware

1	1	**QUICKEN 6.0 FOR DOS** (Intuit) Financial management for nonaccountants. New add-ins for this DOS version make running a small business easier and more cost-efficient. $69.95.
2	4	**THE PRINT SHOP DELUXE FOR WINDOWS** (Broderbund) Create cards, flyers, banners, and calendars easily with this Windows graphics program. $79.95.
3	2	**QUICKEN 2.0 FOR WINDOWS** (Intuit) Organize finances painlessly with the QuickFill automatic data-entry feature, IntelliCharge credit-card checking, and a single-line register view. $69.95.
4	8	**MICROSOFT MONEY 2.0 FOR WINDOWS** (Microsoft) Track expenses, generate budgets, and reconcile accounts with this personal and small-business finance program. $69.95.
5	17	**PRODIGY MEMBERSHIP KIT** (Prodigy Services) A simple connection via modem puts you in touch with online shopping, movie reviews, stock reports, and more. $49.95.
6	3	**TURBOTAX FOR DOS 1040** (ChipSoft) Quick and painless taxes. Choose the EasyStep option for a step-by-step approach to completing your tax return. $79.95.
7	10	**QUICK AND EASY FOR THE SF-171** (DataTech) This DOS-based program provides an easy way to keep your "Application for Federal Employment" up-to-date. $49.95.
8	5	**THE PRINT SHOP DELUXE** (Broderbund) The Deluxe edition of this DOS program makes great-looking cards, flyers, banners, and calendars. Includes 30 fonts. $79.95.
9	6	**TURBOTAX FOR WINDOWS 1040** (ChipSoft) The EasyStep System guides you through the preparation of your income tax return, makes suggestions for saving money, and flags items that could trigger an audit. $79.95.
10	12	**THE NEW PRINT SHOP** (Broderbund) Combined with its many add-ons, this DOS-based program creates fun, personalized greeting cards, signs, calendars, posters, banners, and letterheads. $59.95.

These software charts are compiled by G. Meier, Inc., which gathers ranked-order sales information supplied by the following software industry sources: 800-Software; ABCO Distributors; American Software; Babbages; Baker & Taylor Software; Compusoft; CompUSA; Dalsey,Hyek; Dustin Discount Software; Electronics Boutique; Ingram-Micro; Kendl, Merisel; Micro Warehouse; Multiple Zones, Navarre; PC Connection; Software Resource, Software Spectrum, Software, Etc , and Wolfesoftware. They represent sales through tens of thousands of resellers. A weighting system is applied to each entry based on three factors: the entry's position in the individual chart, the power of the contributing source based on annual gross sales, and the relative strength of a source in a given category of software. All prices are suggested retail and are subject to change.

Utilities

May	Apr	
1	23	**MS-DOS 6.0** (Microsoft) This upgrade to Microsoft's operating system includes new features such as data compression and virus protection. $129.95.
2	1	**WINDOWS 3.1** (Microsoft) A graphical multiapplication environment for exchanging text, numbers, and graphics freely between applications. $149.95.
3	2	**QEMM-386** (Quarterdeck) Free more memory for your primary applications by loading drivers, TSRs, and DOS resources into high memory. $99.95.
4	4	**MS-DOS 5.0** (Microsoft) Version 5.0 is still selling strong despite the release of DOS 6.0. $99.95.
5	3	**STACKER 3.0 FOR WINDOWS AND DOS** (Stac Electronics) Instantly and safely double your hard disk capacity with this data-compression utility. Software only, $149.
6	5	**AFTER DARK** (Berkeley Systems) Give your Windows screen a break with flying toasters, fish, meteors, and other whimsical animated images. $49.95.
7	8	**NORTON UTILITIES 6.0** (Symantec) Norton's DOS-based diagnostic tools are more useful than ever. Recover damaged data from files compressed with DOS 6.0 and Stacker. $179.
8	6	**LANTASTIC/AI** (Artisoft) This adapter-independent peer-to-peer network operating system runs networks of 2 to 500 PCs with any third-party network card. $119 per node.
9	-	**MOREFONTS 3.0** (MicroLogic Software) Get on-the-fly type scaling for WordPerfect, Microsoft Word, Microsoft Works, and other applications. $149.95.
10	-	**PC TOOLS FOR WINDOWS 1.0** (Central Point Software) Customize your Windows desktop and fine-tune your system's performance with this collection of Windows utilities. $179.95.

Learningware

1	14	**STORYBOOK WEAVER** (MECC) Children ages 6 through 14 create their own storybooks by weaving together ideas, words, pictures, sound, and music. $49.95.
2	6	**DINOSAUR ADVENTURE** (Knowledge Adventure) The first disk-based PC product that features a book you can read aloud, along with a story that contains digitized speech. $49.95.
3	-	**FOLLOW THE READER COMBO** (Walt Disney Software) Mickey heads to the beach for some fun and surfing. A talking adventure game for children ages 4 through 7. $69.95.
4	-	**MONARCH NOTES VOL. 1: THE LITERARY TRADITION, DOS** (The Bureau of Electronic Publishing) Learn the classics or create the perfect five-minute book report. $49.95.
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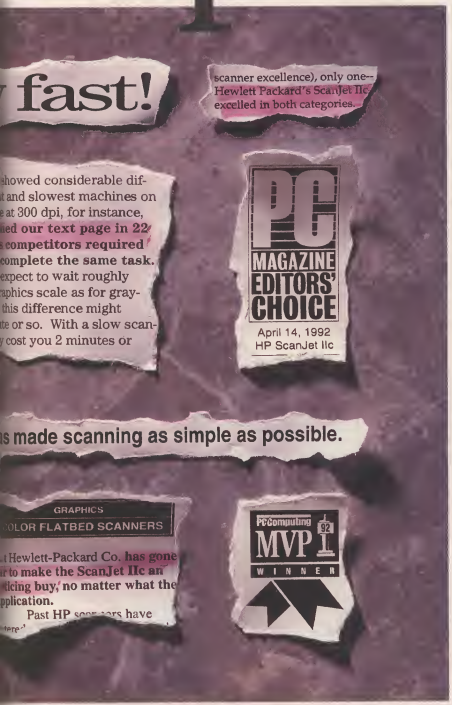
Should you upgrade to Microsoft's DOS 6.0? If you're a Windows user, the answer is a resounding yes. DOS 6.0's DoubleSpace utility compresses files, effectively doubling your system's hard disk space. The built-in disk defragger ensures that DOS stores these huge Windows files efficiently, while the automatic memory-configuration utility frees up memory for DOS applications that you run under Windows. DOS 6.0 is more Windows aware in other ways as well—all of the standalone system utilities, including the virus fighter and the backup program, are available as Windows applets and also from the DOS command line. You can reach Microsoft at (800) 426-9400 or (206) 882-8080.

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HP ScanJet IIc



HP ScanJet IIp

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Impressed? Don't just take our word for it, or even the PC press's. Attend one of our scanning seminars that will be held April through September, 1993. To find out more about the HP ScanJet IIc and IIp or seminars in your area, call 1-800-SCANJET, Ext. 7365.* And judge for yourself.

HEWLETT PACKARD

John C. Dvorak

The Windows NT Sleight of Hand: Microsoft's Artful Promotion

HERE WE GO AGAIN. MICROSOFT'S MEDIA MANIPULATORS ARE somehow getting everyone to promote a nonexistent Windows 4.0 instead of a nonexistent Windows NT. After cheering for Windows NT for more than a year, the trade magazines are all backing off fast. What the heck is going on?

It's embarrassing that, since the Windows 1.0 announcement, industry pundits have taken as gospel whatever Microsoft has told them—right or wrong. It's continued from Windows release to Windows release and even during Microsoft's association with OS/2, when everything Microsoft said about OS/2 was parroted. Microsoft's OS/2 litany is still carefully repeated, but now it's anti-OS/2 tripe. For instance, a recent trade weekly asked Bill Gates if he felt that OS/2 was a dead-end platform. Gates replied, "It's certainly a dead end. That's indisputable. Nobody would dispute that it's a dead end." (Sheesh. Has anyone ever heard of editing? Can we say "dead end" one more time?)



Microsoft's battle concentrates on keeping customers away from OS/2 by promising all sorts of great things "in the future" and on bringing out stopgaps in the meantime. I have seen panicky nonsense before, but the latest round is getting ridiculous. Exactly how is OS/2 a dead end? It's virtually the same thing as NT—only it works.

Coaxing the Trade Press

The worst aspect of all this is how easily the trade press is cajoled into following Microsoft's suggestions. Over the past few weeks I've read more than 400 articles on Windows NT. Most extol its virtues. Only *PC User* out of the UK and a few other foreign publications have been critical. Criticism in American magazines is always balanced by some fawning Microsoft lackey saying that it ain't so or that it will be fixed immediately. It's pathetic.

In the United States we get such stirring articles as "Why You'll Become a Windows NT Fan, Too" in which the writer says, "Suddenly it struck me—NT is real, and it's coming soon." Gads.

InfoWorld has promoted NT, with editorials praising it as the future and articles like "Play 'Taps' for Unix on the Desktop, Then Buy Some Microsoft Stock" (November 16, 1992). The author says that Windows NT will probably be the dominant operating system for desktop computers, period.

Then, when the delays of NT become apparent, every magazine apologizes for Microsoft with articles that rave about the technology while offering excuses. It's as though nobody wants to move the carrot too far in front of the donkey—NT can never be more than two months away. An article entitled "Microsoft Sticks Its Neck Out—Promises Windows NT by Year-End" gushed about the company to keep the carrot right in range: "Microsoft, losing none of the cockiness that goes along with being the No. 1 software company in the market, has stuck its neck out, saying it expects to ship Windows NT before the end of this year . . . Microsoft is pulling out all the stops in order to ship its 32-bit operating system before IBM's OS/2 2.0 gains a stronger foothold in the market. There had been rumors that the ship date might slip into early 1993, but at press time, Microsoft reported smooth progress toward completing the project on time."

A perfect example of taking Microsoft's pronouncements as gospel. What "stops" were being pulled out? Who knows? By the time this story hit the stands, Microsoft had already admitted that NT's ship date would be delayed.

Even when the trade press admitted the lateness, they buffered it with gratuitous optimism and blatant promotion. Another newsweekly ran a piece called "Windows NT Delay Gets Mixed Reaction; Microsoft Says NT to Ship in Q1 '93," with this upbeat plug at the end: "Alfano said, however, that NT seems solid now and he thinks it could be available in the first quarter. In any case, he believes NT will be worth the wait."

I can go on and on and on. *The Microprocessor Report* plugs NT, *Datamation* gives it a thumbs up, *Computerworld* says it's great, and *Byte* does a special story. Last year a columnist declared, "Windows NT is the new open system of choice. Unix has failed." How can something not close to shipping be the system of choice?

The Circular Promotion

After all this bluster, the magazines ask end users if they think they'll be buying NT. Guess what? All the end users say yes, they are planning a big buy. Why? Because NT is great; it's the future. Where did they find this out? From the magazines, where else?

How can something not close to shipping be the system of choice?

Then, boom! In April an article in a trade weekly appears simultaneously with a column in one of the Windows magazines. I suspect Microsoft has been pulling strings again. The articles shift gears. NT is suddenly *not* the thing to talk about. It's Windows 4.0—yeah, that's the ticket. Cairo, Chicago, whatever they call it. Win 4. Furthermore NT isn't a godsend anymore. In fact it may not be that big a deal. Win 4 is the ticket. There are rumblings about de-emphasis. Win 4, Win 4, Win 4. Forget NT, I'm told by a Windows fanatic. Too expensive. Poor performance. Win 4, he tells me, is where it's at.

And the donkey heads toward a fresh new carrot.

PHOTOGRAPH BY RUDY MANCUSO

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You Know I Can't Hear You When My Modem Is Running

So this morning I get a call from headquarters in Ypsilanti, where people are for the most part in the continuous process of improving the manner and means by which this corporation chases its own tail. It's Catherine from Internal Relations (No! I had that checkup just last year!) who wants to inform me that a message of critical importance is coming my way over the interorganizational electronic mail system. "Mr. Nofziger instructed me to tell you to access it as soon as it's posted," she told me. Actually, she didn't tell me. She told my secretary, Betty, who leaned in through my doorway and informed me of this incandescent news while she was on the way to one of the many undesignated activities that pull her away from her desk for 30 minutes at a time. What the heck. She's only human, Betty is, and with human beings come human problems, especially in business.



Which is why I love e-mail so much. Yep. Next to unsolicited faxes and guys who yell into their cellular phones in restaurants, it's my favorite business phenomenon, because it successfully removes humanity from one more aspect of business life. We're way too lax about it around here, let me tell you, with people talking to each other all over the place, and passing paper on stuff that should clearly be handled electronically. And that's a doggone shame, because e-mail inherently makes everybody's life so much easier.

Like this morning. Instead of Nofziger simply telling me that the company had acquired a new steam-turbine subsidiary, I got a chance to spend 8 minutes remembering the fact that my password had been changed, finding out what it had been changed to, logging in, feeling good about myself for resolving a couple of Kermit problems, reading the essential message that had absolutely no bearing on my business at all, and disposing of it electronically! Convenient? You bet! Would that everything in business were so easy!

So this month, with the desire to burst forth in praise mounting forcefully in my ample bosom, let's post a song of e-mail and all the good things it offers!

Freedom from choice. Perhaps the best aspect of our e-mail system is that users like me never had to waste a minute considering which application to use. Could we employ the new, sexy Procomm Plus for Windows, with all its automation and neat little icons? Nah. How about Da Vinci eMail for DOS—sleek, simple, and well documented? Nope. Instead, the company selected a proprietary system based around the DynaComm shell and simply mailed us the floppies: Windows-based for Windows users, DOS-based for lunk-headed techno-weenies. Convenient? You bet!

Freedom from training. Don't you just hate forced gatherings of boring people? Your heart slows to a cryogenic rate, your eyes grow as fat and rheumy as oysters, your limbs turn numb and clammy . . . and the next thing you know, your associates are leaning over you, slapping your face, and saying, "He's coming around now, thank God." This describes all company training sessions, right? Well, no such thing was ever planned or executed for our e-mail system! Not at all! And except for a couple of idiots who couldn't tell the difference between uploading and downloading and who have no working knowledge of protocol conventions, we all just got up and running! Convenient? You bet!

Great security. There are a hundred little ways unscrupulous folks can intercept sensitive business communications. Eavesdrop through doors. Tap phones. Look over your shoulder while you're typing a memo. Pick up faxes meant for other people. Sneak up behind you and blurt, "What's happening with the Zalaznick merger?" in a loud voice that surprises you and makes you reveal proprietary information before you even know it. With e-mail, there's no such problem. We have passwords that automatically change every three weeks. You change them yourself, in fact. And if you miss the day you're supposed to change them, all you have to do is call the e-mail administrator in Altoona, speak to the voice mail, wait for a call back, brush away those cobwebs that have grown between your nose and the phone, make adjustments, and you're off and running! Convenient? You bet!

Dummies get punished! Just last month I went all the way to a meeting of our Waste Treatment and Mutation Subdivision in Cleveland. I took a cab from the airport all the way into downtown, only to find that the meeting was taking place—guess where?—back at the airport! "How was I supposed to know that?" I inquired pleasantly. "We posted it on e-mail last night at 4:30," the department secretary told me without apology. Was my face red! Everybody else made it there no problem at all. Why? Because they read their e-mail, which is the easiest and simplest place for important and timely information to be! Convenient? You bet!

Let's post a song of e-mail and all the good things it offers!

Interesting fun for everyone. There are six wire services you can waste time with, and dozens of critical announcements that no serious player should be without. Today came news, for instance, that Boris Karpovic has been awarded

PHOTOGRAPH BY RICHARD MORGENTHEIL



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Gil Schwartz

our corporation's highest honor—the Award of Total Quality Supremacy—which comes with a medallion, a parchment certificate, and an invitation for early retirement. Here's one that lets everyone know that the change in health benefits that was incorrectly explained in last week's e-mail on the subject will be clarified in an upcoming e-mail.

Here's another announcing the acquisition of a small biotechnology firm specializing in . . . genetically altered neoconservatives? Perhaps I didn't read that one correctly, because, well . . . there's so darned much to keep up with when you're an e-mailhead. Data! News! Insight! Gossip! Convenient? You bet!

Total alienation, minimal accountability. Right now, for example, I have genuinely important work to do. Eight people must be contacted and made to agree on a certain policy move that, frankly, you don't need to hear about. We've got to act on it by tomorrow close of business, though, or a key opportunity will slip away.

In the old days, I would have gotten on the horn and contacted each and every person on my list. I would have fought for consensus. I would have achieved it. I would have gone home exhausted and possibly frustrated (if Lemur in Accounting had put up roadblocks the way he sometimes does).

Today, instead, I think I'll simply put a short e-mail together articulating the problem and post it to everybody involved, with a request to get back to me on the system by 10 a.m. tomorrow. Nobody will, except perhaps for Nardo in Legal, an assiduous detail man who's always at his desk and never neglects a posting. The rest will probably miss the window.

It won't be my fault, either. I did things the right way. I communicated. Is it my fault that people aren't as efficient or able as the system that serves them?

And instead of going home late and feeling tired, I'll pop onto the 5:47, grab a vodka with lime, read my industry trade journals, maybe even catch a little nap on the way to my station. That's technology! That's progress. Convenient?

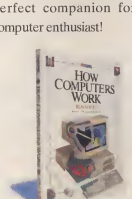
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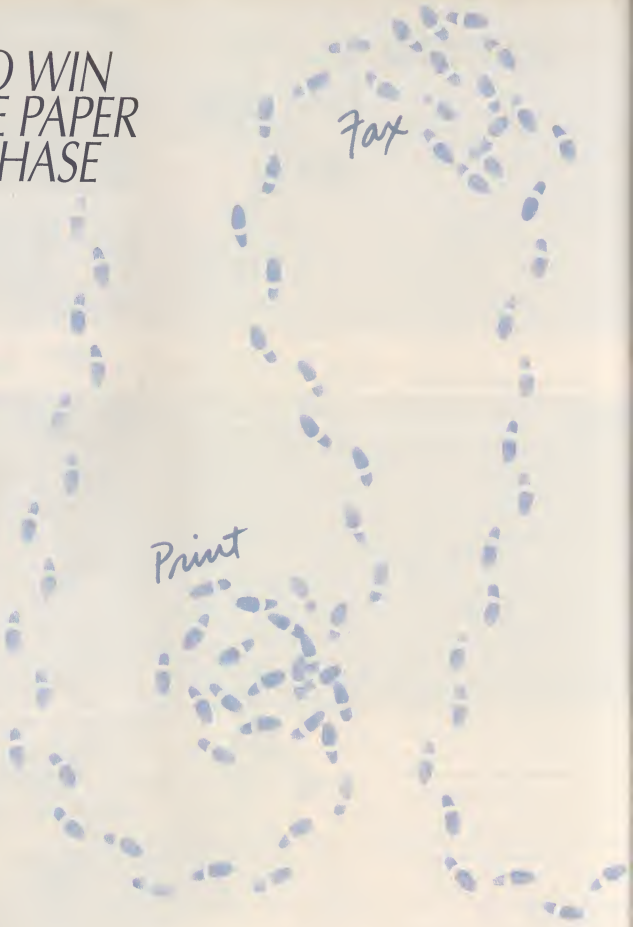
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Thomas Watson's Vision for IBM Is The Secret Weapon Gerstner Needs

AS A CONSUMER PRODUCTS MARKETER WHO'S WOUND UP IN charge of a troubled high-tech company, IBM's Lou Gerstner needs a secret weapon. John Sculley had one at Apple named Steve Jobs. Throughout their brief and stormy relationship, Jobs educated Sculley about computer technology and about his vision of its future. Similarly, Gerstner had a secret weapon at American Express, where the effervescent Jim Robinson saw a financial superstore where only a credit card company existed before. And at RJR Nabisco the steely-cool leveraged-buyout guru Henry Kravis set the company on a course that took it down one of the rockiest financial and management roads in American business history.



Gerstner has no secret weapon at IBM. He'll be virtually alone on top of the pile with a board that hasn't done much to lead the company in the past. Gerstner will have to create his own vision, have the guts to follow it, and exercise the leadership that will bring the company with him. Gerstner's record, especially at RJR Nabisco, shows he has the tenacity and the leadership qualities.

But creating a fresh vision for IBM will be something else—and he ought to look first at the company's historical roots. When Thomas Watson founded IBM, its purpose was to provide services to its business customers that would make them more efficient and profitable. Watson actually used to tell his salespeople that their customers' profits were the only products they sold. To deliver those profits, IBM acquired the technology that provided essential services, including typewriters, time clocks, and Hollerith's punch-card tabulating machines. IBM's machines were leased rather than sold, and the company provided people to train the operators and maintain the equipment.

What Went Wrong

That IBM model prevailed while electronic computers were being invented and deployed throughout most of the mainframe computer era. Software, for example, was produced only to enhance the basic operation of the machines and to increase their service level, which explains why IBM never invested much in applications software. But this model began to break down as minicomputers became inexpensive, and then fell apart completely when PCs became truly cheap.

All of a sudden, IBM found itself in the product sales business, with little or no means of creating the type of products the new market and its customers demanded. The leasing model, which had worked even in the minicomputer era, collapsed in the face of personal computers that cost less than $3,000 each. Customers demanded solutions that called for new software to be developed, and they required faster delivery than IBM was prepared to offer.

Worst of all, IBM's fabled customer service couldn't survive in the new era. Servicing users required telephone-based technical support that could handle problems with hardware, operating systems, networks, applications software, and peripheral devices. And for the first time, IBM had to provide service to customers who used products not made by IBM.

Experience Where It Will Count

Now, even as Lou Gerstner finds the executive dining room in Armonk, the entire computer industry is going through a technical transition from host-based business systems to PC-centric, client/server-based systems. This change is so massive, painful, and complex that it's unlikely that *any* company currently in the hardware or software business will be able to provide adequate service. The complexity of most client/servers systems usually overloads the technical capabilities of their implementors and users. But IBM's experience in servicing international mainframe networks and complex system architectures may hold the answer to that problem, which makes Thomas Watson's vision for IBM the secret weapon Lou Gerstner is looking for.

No one in the computer industry has more experience in providing the service required for large-scale data processing and complex wide-area networking systems than IBM. In fact, IBM probably installed most of the mainframe systems that will undergo transition to the new client/server world. You have to wonder if there's anyone more qualified to provide service and support during this transition.

This isn't news to IBM. Two years ago the company started IBM Consulting Software and Services for exactly this purpose. The group has an excellent reputation and works with little regard for the brand name on the equipment and software they install and service. By all reports I have heard, IBM Consulting Software and Services is profitable. And why wouldn't it be? Demand for service and support is high, and service capacity—paid or free—is low.

Every decision Gerstner makes should prioritize customer service.

That doesn't mean that IBM should just be a service and support company. It does mean that every business decision Gerstner makes for IBM should prioritize customer service. All the supposedly profit-smart, product-oriented tactics in the world didn't help John Akers strengthen the company's income during the last five years, and they won't help Lou Gerstner do it next year, because an IBM without a strategy is an IBM that will only sink further into the abyss.

PHOTOGRAPH BY PAUL STAGEN

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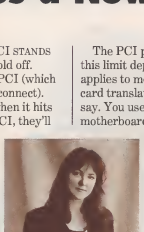
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Gina Smith

VL-Bus vs. Intel's PCI: The PC's Local Bus Takes a New Turn

TO HEAR SOME PC MAKERS TALK, YOU'D THINK PCI STANDS for Please Conform Immediately. My advice? Hold off.

You are about to be deluged with news about PCI (which actually stands for Peripheral Component Interconnect). This is Intel's new spec for local-bus PCs. And when it hits the market this fall, you're going to hear it all: PCI, they'll say, is faster and more reliable, and it supports more peripherals than the current VL-Bus standard. The kicker is, it's a bus designed from the ground up, not just an add-on to a PC's existing CPU bus.



Does that mean you should forget about plans to buy PCs based on the current and prevailing standard, VL-Bus? Only if you're crazy.

You Call This a War?

Lots of people are predicting a local-bus war between VL-Bus and PCI. But marketspeak aside, we're not even talking the same battlefield here.

It's true that PCI and VL-Bus do basically the same thing. Both speed up PCs by letting peripherals like graphics adapters and hard disk controllers run at up to 33MHz, instead of the 8MHz that the typical ISA-based I/O bus constrains them to.

But the resemblance breaks down when we start talking about how the two designs work: VL-Bus bypasses the I/O bus by using the same bus the CPU sits on—so it's relatively cheap and easy for PC and peripheral makers to implement. Intel's PCI, on the other hand, is a whole new bus, in much the same way EISA and MCA were. While that translates into more flexibility and speed, it also means peripheral makers have to do more to make their products work with the design. And that costs everyone money.

That's why the 486 platform belongs to VL-Bus. With the exception of a few Intel-only drones like Compaq, Dell, and HP—which are shipping proprietary local-bus systems presumably until PCI comes out—every new system you see these days includes at least one VL-Bus slot. And unlike the slightly faster PCI on a 486 system, it won't cost you a mint. Considering the performance boost you get with VL-Bus (two- to fivefold in standard Windows applications) and the fact that you can install ISA as well as VL-Bus cards in VL-Bus slots, there's absolutely no good reason to go with anything but.

Predictably, PCI boosters love to point out the limitations of VL-Bus: It only supports four VL-Bus peripherals, and there are timing problems at external processor speeds of over 33MHz. Big deal: After putting video and hard disk control on the local bus, what else is there? Networking or compression, maybe. You'd be hard-pressed to use more than four VL-Bus cards in a regular ISA desktop system.

The PCI people brag about PCI's ten-peripheral limit, but this limit depends on what you call a peripheral. The limit applies to motherboard-based components, not cards. Each card translates roughly into two peripherals, Intel designers say. You use up two PCI slots with IDE and graphics on the motherboard, for instance, leaving slots for four cards max, since they each count as two PCI "peripherals." It's an improvement, sure, but not as great as some PCI supporters want you to think.

And yes, VL-Bus does slow down on motherboards that work externally at over 33MHz. But how many 486 motherboards do that? Only the 486DX/50 CPU. Even 66MHz 486DX2s operate at 33MHz externally. PCI peripherals, by the way, are also limited to 33MHz. Unlike VL-Bus, though, PCI doesn't run faster than 33MHz, and it won't try to operate at higher speeds. This means that PCI won't cause slowdowns at CPU speeds higher than 33MHz.

No wonder PCI proponents are positioning it as a next-generation local bus—something that is more a competitor to EISA and MCA than VL-Bus. And here, finally, is an argument that makes sense.

Killing EISA

As a 64-bit implementation on a Pentium, PCI will soar. It'll still be limited to 33MHz speeds, but the double 64-bit data path should make it mondo fast. And when you're talking about servers, pricey PCI systems and components aren't overkill at all.

Expect server makers to build killer PCI systems that will run comparably equipped Pentium EISA systems into the dirt. Why spend big bucks for EISA peripherals that move data at 10MHz when you can do it at three times the rate with PCI? PCI might spell the end for EISA and MCA.

No matter what Intel tells you, the 486 platform still belongs to VL-Bus.

The question, of course, is when. S3, ATI, and Tseng Labs will all be producing PCI versions of the same graphics chips they've got under ISA and VL-Bus, and NCR is developing a PCI version of its motherboard-based SCSI circuitry. And you can expect Compaq and Dell to jump right in with 486 and Pentium PCI systems; everyone else will wait until prices come down.

It's tempting to think that VL-Bus is just some interim solution that won't make sense a year from now. In Intel's dreams, maybe. Because unless you're into plunking down major change for a Pentium PC, PCI is just an expensive also-ran. Promising, yes. Interesting, sure. But today, VL-Bus is the only local-bus solution for most of us here in the real world. ◩

PHOTOGRAPH BY JOE MCNALLY

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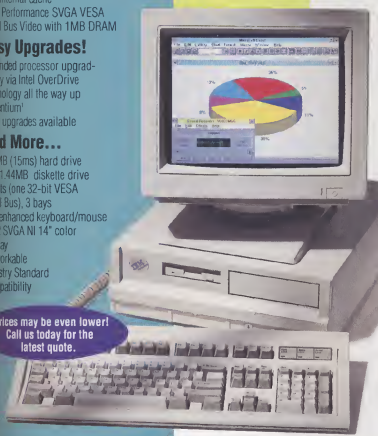
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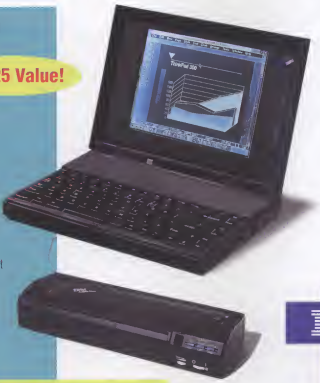
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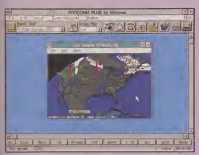


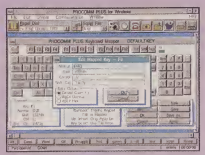
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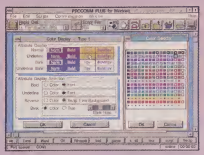
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The Video Revolution Is Here—But Will We All Be Using Windows-TV?

MICROSOFT, INTEL, AND GENERAL INSTRUMENT RECENTLY leaked to the press that they are jointly working on a system to empower the home TV set using a Windows interface. Will you really be using a version of Windows-TV in the near future? Will Windows appear in other home appliances? Will this affect the way we all work? John and Paul slug it out again.





SOMERSON: The current television interface stinks. You can't even do simple things like click on a program while you're channel surfing to find out what it's called, who's in it, or whether it's been bowdlerized by some politically correct network bluenose. Adding intelligence to TV (what a concept) and a decent interface is a slam dunk of an idea. But if Microsoft really wants to bring its GUI to the masses, it had better come up with something a lot more friendly and intuitive than Windows.

DVORAK: "The current television interface stinks." Oh brother. You pick a channel and watch it—what could be easier? Who wants to add a mouse and GUI interface to the simplicity of a channel selector? As for clicking on a channel with the mouse to see what the program is called—ever heard of *TV Guide?* And how the heck are you going to find out the program has been "bowdlerized by some politically correct network bluenose"? You think the network is going to broadcast that information on a subcarrier or on the Teletex line? Why should they? Why would they? This is just another attempt by Microsoft to get into the consumer electronics business. The last time they did this it was with MSX, and it was a big flop.

SOMERSON: John, how come you end up on the wrong side of *every* issue? First, a channel changer is no more real an interface than a DOS prompt. If you switch channels during a commercial, you can't tell what the show is. If you stumble onto a movie, you don't know what the name is, who made it, who's in it, when it started, when it will end, or whether it's been savaged by some censor. If you stumble into the middle of a sports program, you don't know who's playing, who's winning, or who left the game earlier. And that's just the tip of the iceberg.

With a computer hooked to hundreds of channels you could do truly personalized shopping, or exotic time shifting, or family teleconferencing, or sophisticated automated news and entertainment filtering (gathering all the clips shown anywhere about your hometown, or queuing all variety shows with animal acts). You could dig into vaults of movies and old TV shows and news files, walk through the interiors of houses for sale, even play giant real-time networked video games with thousands of people around the world.

DVORAK: Hey, you started the argument . . . *You* called it an interface.

SOMERSON: Telling people to buy a fine-print publication and wade through it to get the information they need is like some arrogant vendor telling people who have trouble using an awful feature of his product to read the manual. Anyway, there are so many channels and so many local variations already that *TV Guide* is becoming worthless. Besides, it can't report things dynamically—like who's winning a ball game. Also, compression and better cable delivery mechanisms will give us close to a thousand channels. You'd need a *TV Guide* the size of an unabridged dictionary.

DVORAK: I don't know if you've noticed this, but during a ball game they give the score. Anyway, go on.

SOMERSON: Sure, if you want to sit there and wait five minutes for it. People who flip through channels don't linger. And they don't have an instant stat book at their fingertips like one that cable could provide.

Is the network going to broadcast the other information you so blithely dismissed? Duh, no. But networks will be far less important. The cable folks will be happy to sell you any information you need—from real-time sports scores to who's in the movie or whether it was edited for TV.

Microsoft is smart to get in here now. The information home-delivery business is going to change our culture and make a lot of people rich. With all the complexity and choice, a cheap 386-based TV-top computer will definitely be needed. I wonder how Microsoft will make its clanky interface friendly enough for all the Joe Sixpacks out there. Laugh at progress all you want, Dvorak. Keep your head in the sand.

DVORAK: Head in the sand indeed. You boost any scheme that Intel and Microsoft come up with and accuse all detractors of having their heads in the sand—just like some gullible, golly-gee-whiz cheerleader. And what's making

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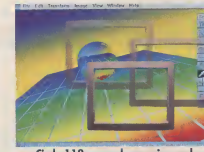


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Dvorak vs. Somerson

money got to do with practicality or viability or, for that matter, common sense? I'm not denying these guys are going to make a lot of money selling people useless services. Hell, drug dealers make a lot of money, too. By your logic we should all jump on their bandwagon for that reason alone. As for Microsoft making the interface easy for Joe Sixpack to use, maybe something like a knob will work.

SOMERSON: Great. You take your knob and your 1,000-page *TV Guide*. The rest of us will demand an intelligent box to help us manage the glut of information—movies, audio recordings, newspaper and magazine articles, book excerpts—that will soon be swamping us. Information on demand. The bandwidth bandwagon is unstoppable, John.

Frankly, it doesn't matter who comes up with the box or the software that makes everything accessible. The reality is that Microsoft wants to put Windows in every home. Gates' vision is an extension of the old big blue dream, of an IBM PC on every desktop. And Microsoft has a real shot at it.

DVORAK: What have you been smoking? Sure a smart TV controller that tells you what you're watching is better than a 1,000-page *TV Guide*. But most people use *TV Guide* to see what's on next or on Tuesday at 11 p.m. So this product will have to provide that information, too, and more easily than the guide can.

SOMERSON: Glad to see you've come around, John. And golly—do you think a computer system will be able to display next Tuesday's TV listings? I dunno . . . And can you imagine that a giant operation like *TV Guide* might possibly be considering a smart, electronically interactive edition? Oooh, what a puzzler . . .

DVORAK: Ever look at Microsoft documentation? These guys aren't into simplicity. If Apple were doing such a product I'd be more inclined to agree with you on the overall thesis.

SOMERSON: Again, my point exactly. It's one thing for Microsoft to dominate a world of relatively smart business-people. It's another to go into homes where VCRs are perceived as fearfully complex systems.

DVORAK: As for information on demand, give me a break. Real information has become more expensive than ever. Look at Microsoft's first release of the CD-ROM Bookshelf. It would have been cheaper to buy all the hardcover books that were included than to buy the single disc. The CD-ROM, meanwhile, costs a buck to manufacture.

This is the Paul Somerson rosy future: Getting ripped off with a smile on your face. Information on demand with someone's hand in your pocket stealing your wallet. In fact, the public will balk at this nonsense the same way they balked at the original Microsoft Bookshelf. I'd rather get a satellite dish and the 1,000-page *TV Guide* and still have a bank account. I'm not so desperate that I need to watch instant movies or pay an arm and a leg to retrieve a book excerpt.

SOMERSON: Get real, Dvorak. The first Microsoft Bookshelf was a prototype. By today's standards the first PC was a piece of junk, too. So were the first car, the first airplane, the first television. Now that the CD-ROM business is heating up, we're starting to see a critical mass of players (in both senses) out there, and some real competition.

Information on demand is already happening. Lots of users in pilot projects will be getting video dial tones in the next year or two. Imagine being able to type in your requirements for a new home or car and have a system instantly search through electronic classifieds and show you videos of the ones that match. But hey, John, if you want to ignore it all and hold on to your pennies, nobody will care.

But at least we agree that unless Microsoft dramatically changes its interface or another company makes a better one, this will all be too hard to use. Do you really think there will be a copy of Windows-TV in every home?

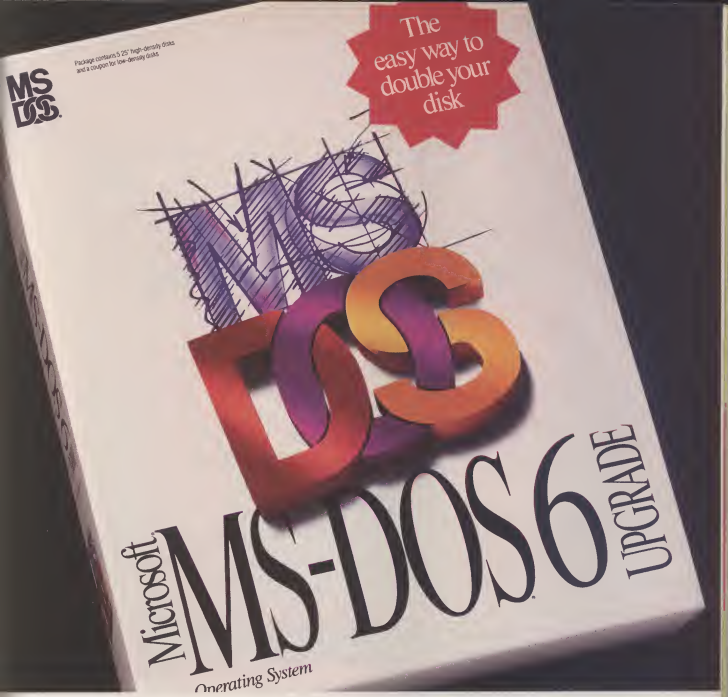
DVORAK: First of all, Microsoft didn't invent the CD-ROM and Bookshelf was hardly a prototype. Ahead of its time, maybe! And as for video dial tones, I'm game. But it's another golly-gee-whiz deal you go for sight unseen. Where's the video dial tone? Where's ISDN? Where's any of it? I can't get worked up about smoke and mirrors.

As for the Windows interface, it's not that bad once you get used to it. Kind of late to change now. So, no, I don't agree with that either. The knob on the TV set is a good enough interface for me. There's nothing good on TV most of the time on the 40 or so channels I get anyway. With a Windows interface and a 600-channel cable, it will just take longer to go around the dial. Maybe the new system will bring up a big menu so you can instantly see that there's nothing good on. I suppose that would be a big step forward. A bigger step would be to decide to watch less TV and, instead, go visit some friends, play tennis, sip wine, do something away from the tube.

SOMERSON: Gads, don't you ever get tired of whining? And complaining? And being wrong? First off, Bookshelf *was* a prototype—the first collection of decent reference works (though with a pathetic interface) from a major company. Second, you ask where all this stuff is. It's under your upturned nose, John. TCI Cablevision, the country's biggest

Maybe the TV will bring up a big menu so you can instantly see there's nothing good on.

cable supplier, is dropping a whopping $2 billion to put fiber and compression systems into 400 U.S. communities, including yours. Third, nobody—except a knob-happy guy like you—is going to flip through all those channels. That's why we'll want a computer and a decent interface. Finally, your claim that the Windows interface isn't that bad and that it's kind of late to change is predictably absurd. You once made these arguments about DOS! There is no way in a billion lifetimes that people who can't figure out how to set a digital clock or use all the buttons on their kitchen appliances are going to use Windows on upcoming information appliances. "Honey, do you have volume 8 of the docs and disk 74 of the drivers?" Yeah, right. Give it up, John. And just hope Microsoft can come up with something better.



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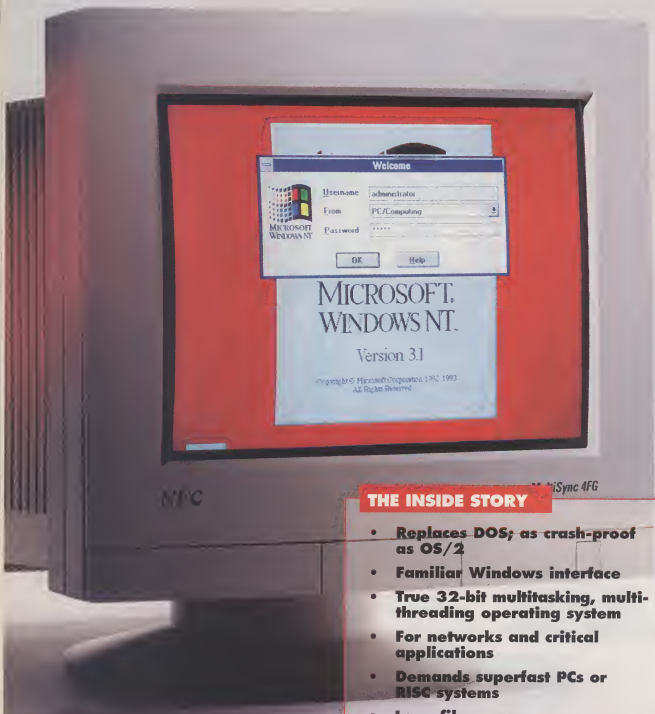
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With Windows NT, Microsoft has designed the PC operating system of the future. NT stands for New Technology, but most of the notable features of NT are already available in other operating systems. It looks and works like Windows, runs 32-bit apps in bulletproof fashion like IBM's OS/2, and offers powerful enterprise-wide networking capabilities to rival Novell's NetWare 4.0. It's powerful and flexible, and it provides a broad range of integrated functionality—support for multiple hardware platforms, built-in peer-to-peer networking, and point-and-click connectivity among DOS, Windows, Windows for Workgroups, and Windows NT PCs.

PHOTOGRAPH BY ERNIE REDMADER

And it works in the real world. Right out of the box, Windows NT lets you connect to and access the shared software and hardware on existing NetWare and other networks. The advanced version of NT adds server-based network capabilities and tools, including centralized local and remote administration.

NT isn't for everyone—at least not yet. If you thought Windows 3.1 required a lot of hardware, wait till you see what you need to run NT. A fast 486 or Pentium PC with 16MB of RAM and 70MB of free disk space is the price of entry. And not all users need this much power on their desktop today.

Businesses with mission-critical applications may be ready to adopt NT the day it's released. Others will want to stagger its introduction to match their hardware upgrade budget. Still others may choose to wait until the operating system is rock stable and there's a large selection of 32-bit applications.

Is Windows NT right for you? And if it is, when should your business make the switch? We've gathered the information you need to answer those crucial questions.

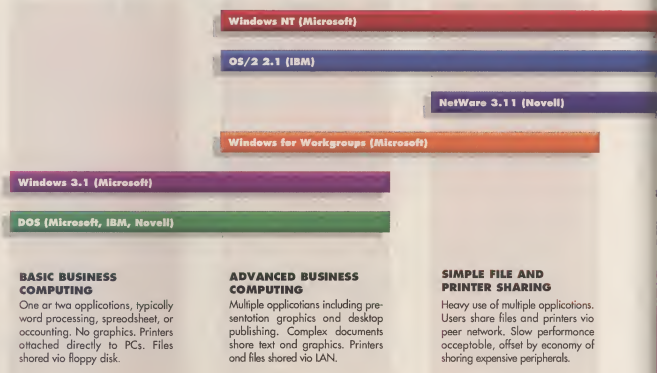
BY DALE LEWALLEN, SCOT FINNIE, AND ED BOTT

NT

MICROSOFT REMAPS THE OS LANDSCAPE

Windows NT wants to be all things to all businesses.

With the overwhelming success of DOS and Windows 3.1, Microsoft already defines how your desktop PC runs. With Windows NT, it wants to take over the network, too.



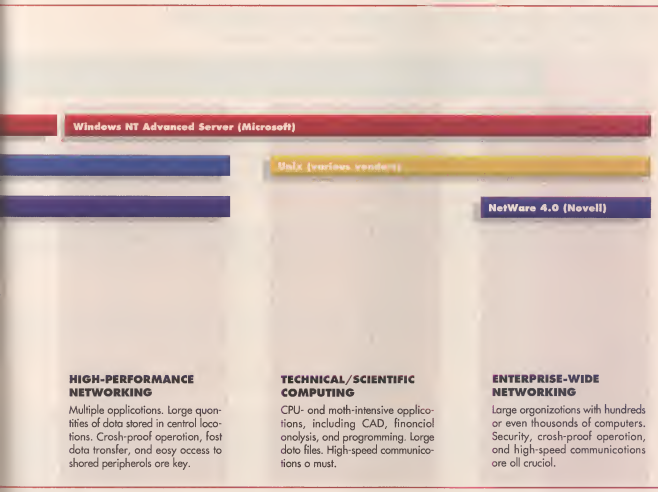
WHAT IS NT, ANYWAY?

Windows NT is a brand-new operating system that completely replaces DOS and Windows 3.1. Its biggest strength is its combination of the well-accepted Windows interface and the robust power and sophistication of a well-designed, full-fledged operating system. Despite Windows 3.1's runaway popularity, it's really just a shell that runs on top of DOS. The trouble is, DOS was never designed to run multiple programs under a graphical shell. When a program crashes under Windows, others often follow suit—an unwanted outcome that NT guards against.

While it's very different beneath the surface, Windows NT looks and acts almost exactly like Windows 3.1 on the desktop. There are some subtle differences, such as the log-on screen you face each time you start Windows NT and the built-in file-sharing and peer-to-peer networking capabilities. You'll also find some new settings in the Control Panel. By and large, though, you'll tend to forget that NT is a completely different animal. And while NT takes longer to install than Windows 3.1 because it's bigger, the installation process is just as easy—easier, perhaps, if you have a CD-ROM drive, since Microsoft is making NT available on CD as well as floppies. The bottom line is that you already know how to use this operating system if you use Windows, so getting up to speed isn't an issue. It is also possible to have DOS and NT coexist on your PC, so you won't have to give up DOS entirely. Sooner or later, though, you'll probably want to.

NT is aimed at business users who value connectivity and increased productivity within and among applications—in other words, just about all of us. But, as with any new operating system, there are trade-offs to consider, especially in the early going. Our tests with a late beta copy of NT show that the performance of existing 16-bit Windows applications isn't up to snuff. In the short term, that could be a serious problem, since 32-bit NT applications will be only sparsely available for a while—the same problem IBM faced with OS/2. Microsoft's solution was to line up software developers early on, so you won't have to wait long for NT apps. They're not here yet, but they're well on the way.

Moreover, NT's device support, while far better than OS/2's, is still spotty in places. Early in an operating system's life cycle, device support is generally scarce. It takes a long time for the hardware vendors to catch up. To its credit, Microsoft recognized the importance of this. Out of the chute, NT will have significantly better device support than OS/2 2.0, for example, had at its release.



You'll find support for all major SCSI adapters built right into the operating system. It recognizes SCSI controllers from vendors like Adaptec, UltraStor, BusLogic, Trantor, and others. Even so, device support for some internal fax modems, some video cards, and scanners that require proprietary controller cards is lacking. (See "Windows NT Compatibility," page 124.)

SERIOUS PRODUCTIVITY BOOST

Windows NT is a true 32-bit preemptive multitasking, multithreaded operating system. An internal module called the scheduler decides which running applications get CPU time. In Windows 3.1, the scheduler is like the United Nations; it's able to ask for cooperation between applications, but it lacks the power to enforce it. As a result, the program whose operation is currently running decides when it wants to pass control to another application. Because NT multitasks preemptively, it can suspend one running application to give control to another, eliminating the possibility of one application hogging all the CPU time. The scheduler in NT is more like a well-trained, clearheaded air traffic controller who makes logical, authoritative decisions geared toward safely and efficiently handling large volumes of traffic.

In the real world, preemptive multitasking significantly boosts your efficiency, especially when you load and work with multiple programs at the same time. Ever try and fail to access another program while Microsoft's Word for Windows is printing a file? That's a good example of nonpreemptive multitasking. Since NT can juggle multiple operations concurrently—automatically deciding how, when, and for how long CPU power is allocated—you can print a WinWord file while you're performing a recalc in Quattro Pro for Windows.

In addition to preemptive multitasking, Windows NT supports multithreaded applications. That means that an application like Excel can have multiple processes, or *threads*, running concurrently. Generally speaking, each thread is a separate routine or operation within a program. In Excel, for instance, one thread might be dedicated to recalculating a model so you wouldn't have to wait for recalculations. Another thread might handle printing, so when you sent a job to the printer you would regain control immediately and could continue to work on the file. Yet another thread might perform a file open in a way that let you start working on the beginning of a long file before the entire file has loaded. Like NT's ability to multitask operations among applications, its sup-

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STACKING WINDOWS NT AGAINST THE COMPETITION

NT takes on graphical operating systems—from desktops to networks.

FEATURES	IBM Microsoft OS/2 2.x	Microsoft Windows 3.1	Microsoft Windows NT	Microsoft Windows NT Advanced Server
Basic OS specifications	32-bit, graphical, multiuser, multitasking, multithreaded	16-bit environment, graphical, for desktop only	32-bit, graphical, multiuser, multitasking, multithreaded	32-bit, graphical, multiuser, multitasking, multithreaded
Installed base	1.5 million in U.S.; 3.1 million worldwide	25 million	Prerelease	Prerelease
Cost	$149.95	$149.95	Less than $500 (estimated)	Less than $5,000 (estimated)
Supported platforms	Intel 386, 486, Pentium	Intel 286, 386, 486, Pentium	Intel 386, 486, Pentium, MIPS R4000, DEC Alpha, symmetric multiprocessing PCs	Intel 386, 486, Pentium, MIPS R4000, DEC Alpha, symmetric multiprocessing PCs
Min. system requirements	4MB RAM, 30MB disk space	1MB RAM, 10MB disk space	8MB RAM, 70MB disk space	12MB RAM, 100MB disk space
Interface type(s)	Workplace Shell	Windows 3.1 interface	Windows 3.1 interface	Windows 3.1 interface
Peer-to-peer LAN features	None currently; may offer some soon	None (provided in Windows for Workgroups 3.1)	File, application, and peripheral sharing; bundled e-mail	File, application, and peripheral sharing; bundled e-mail and scheduling software
Server features	Supports DOS, Windows, and NetWare; also TCP/IP, NFS, X-Windows, Telnet	None	Supports DOS, Windows, TCP/IP, Telnet, and NetWare; remote access, integrated backup	Supports DOS, Windows, TCP/IP, Telnet, and NetWare; domain network model, Mac support, integrated backup, UPS support, duplexing, RAID 1, RAID 5, remote access
Application compatibility	DOS, Windows, OS/2	DOS, Windows	DOS, Windows, NT, Posix, character-based OS/2 1.x	DOS, Windows, NT, POSIX, character-based OS/2 1.x
Security features	C2 government security standard (certifiable)	Password to shell and for screen savers	C2 government security standard	C2 government security standard

port of multithreaded applications greatly increases productivity of simultaneous operations within those applications. The bottom line is that multithreading makes applications work more efficiently and "feel" faster.

THE TWO NTs

Windows NT comes in two flavors—the desktop operating system, called simply Windows NT, and Windows NT Advanced Server, which is designed to be a powerful enterprise-wide network operating system. The two versions start with the same core, but Advanced Server adds centralized remote-administration tools, more fault tolerance (including RAID 5 striping), a more powerful remote-access server, and native support for Apple's Macintosh.

What does it cost to play in this league? Although Windows NT's retail price wasn't set at press time, Microsoft promised it would sell for under $500. That's a good deal more than the $360 you'll spend for the DOS/Windows 3.1 combination, but you get more, too—like bundled 32-bit versions of the Microsoft Mail client and Schedule Plus, and peer-to-peer networking capabilities. The expected price for the Advanced Server edition is under $5,000. Windows 3.1 users and large corporate sites can anticipate very liberal upgrade pricing on both versions of NT. At press time, Microsoft said that it expected NT to ship to users before the cover date of this issue, but operating system development is a complex process, and it's likely that this date will slip.

The less-apparent cost of switching to NT is the operating system's hardware requirements. NT runs only passably on a 386—a 486 or Pentium PC is preferable. And you'll probably have to add memory. Microsoft says that 8MB is the minimum amount of RAM for NT, but that's roughly comparable to running Windows 3.1 with 2MB or OS/2 2.1 with 4MB. We installed NT on machines with 8MB of RAM; while the operating system ran correctly, performance was unacceptably slow. To improve performance significantly, upgrade to 12MB of

Novell NetWare 4.0	USL Unix System V 4.2
32-bit, graphical, multitasking, network OS	32-bit, graphical, multiuser, multitasking, multithreaded
1.25 million installations (NetWare 3.11 & 4.0)	25 million (includes System V)
10 users: $3,195 100 users: $8,795 250 users: $15,695	Desktop: $249 Server: $1,299
Intel 386, 486, Pentium. DOS, Windows, OS/2, Unix, and Macintosh	Intel 386, 486, Pentium, SPARC, MIPS
6MB RAM, 40MB disk space	4MB RAM, 60MB disk space
Network administration interface can be Netuser, Windows, or OS/2	Windows, OSF Motif, X-Terminals, or X-Windows
None (provided in separate NetWare Lite)	File, peripheral, and application sharing; e-mail
File, application, and peripheral sharing, e-mail, integrated backup, duplexing, RAID 1	Application Server supports IPX/SPX, Internet, TCP/IP, NFS sharing services, integrated backup
DOS, Windows, NetWare Loadable Modules	DOS, Windows, SCO Unix, Xenix, ODT
C2 government security standard (pending)	B2, C2 government security standards

RAM. For optimal performance, we recommend 16MB.

While hardware upgrade requirements for running NT may be significant, you won't have to upgrade every PC in your department. The new operating system's built-in file-sharing and peer-to-peer network features mirror the capabilities of Windows for Workgroups 3.1. One of NT's most powerful benefits is the degree of connectivity among Microsoft platforms.

With the $39.95 Workgroup Connection package, Windows NT users can seamlessly interact on a network with users of Windows 3.1, Windows for Workgroups 3.1, Windows NT, and DOS 3.3 through 6.0. With Advanced Server installed on an NT server, you can gain much of NT's power with networked applications accessed from Windows and DOS nodes. What's more, an NT server can extend those services to other nodes across network hardware that is running NetWare, Banyan's VINES, and Microsoft's LAN Manager, among others. For many businesses, the tougher question isn't likely to be "Should we move to NT?" but instead "Which PCs should we upgrade?" (see "Should I Switch to NT?" on page 127).

Support for multiple hardware platforms is another aspect of NT that could help unify your business's computing environment. Both versions of NT run on Intel *x*86 and Pentium machines. They also run on machines with RISC-based processors, like the MIPS R4000/4400, Intergraph's Clipper chip, and the DEC Alpha AXP, as well as symmetric multiprocessing PCs based on these chips. That means you won't be chucking out or creating islands of the hardware you've already got.

THE COMPETITION

Since other graphical operating systems have been available for years, what makes NT worthy of strong consideration? For one thing, it's a new operating system from the company that owns the DOS and Windows standards on Intel-architecture PCs. But that doesn't mean it's invincible.

On technical merits alone, OS/2 is a strong contender because it's a maturing operating system. The latest incarnation, OS/2 2.*x*, has been out for more than a year and is greatly improved over earlier versions. The newest revision, 2.1, runs Windows applications so well, there's little reason for developers to build OS/2 apps that take full advantage of the operating system. That is one of OS/2's chief problems: Even after more than a year of evangelizing on IBM's part, there are few off-the-shelf business applications for OS/2. Moreover, device support remains its Achilles' heel.

Unix has a huge installed base in the workstation market, and Novell owns a commanding share of the installed base of network operating systems. NT is aimed at both of those markets, as well as at Intel-architecture desktop PCs. Microsoft is gambling that it can make serious inroads into these areas.

The battle will be pitched in the network operating system arena. Novell's NetWare is the overwhelming leader among business-oriented network operating systems, and Microsoft's experience with LAN Manager won't inspire confidence among network buyers. Novell has a substantial head start with NetWare 4.0, and its developers aren't simply sitting around waiting for NT to take over the network market. If nothing else, the competition should serve network users well.

There's a lot to know about Windows NT; it's a complex operating system with a raft of powerful capabilities and features. Should your company upgrade? To answer that question, a team of *PC/Computing* editors and ZD Labs technicians tested, measured, and evaluated a late prerelease version of NT, cataloging its fine points and weighing its pluses and minuses. We started with its primary attributes as a desktop operating system and worked through every implemented feature, dialog box, and capability including Windows NT Advanced Server's sophisticated network management tools. You've got questions? We have the answers to help you evaluate NT's potential as your next PC operating system platform.

NT



The NT Desktop—Like Windows, Only Better

The good news is that Windows NT uses the familiar Windows 3.1 interface. That's also bad news, because NT doesn't fully exploit the object-oriented technologies already found in operating system competitors like OS/2 2.1 and NextStep for Intel. Think of object orientation as the modular approach to programming; object-oriented programs are written in sharable modules that consist of reusable, easily maintained code. The upshot is that programmers can later make changes to one section without having to recode entire stretches of the program that don't relate to a problem. It's a newer programming model that ultimately will mean more easily revised, more reliable operating systems, and cheaper, easier-to-use applications that are available more quickly than non-object-oriented apps.

Object-oriented programming is clearly the wave of the future, and some developers, like Borland, have already committed to it. For better or worse, Microsoft decided that sticking to the Windows 3.1 interface was a bigger advantage than moving to object orientation—at least for now.

On Intel-based PCs, NT installation is similar to Windows 3.1's. Since NT is available on CD-ROM, you can walk away from your PC during installation. If you don't have a CD-ROM drive, be prepared to insert and eject 25 floppies.

MIS managers, especially those with large LAN installations, will appreciate the fact that NT installs easily over a network. We installed it on several computer systems with 8MB to 64MB of memory. In all cases, the installation process was flawless.

Unless you specify otherwise, Windows NT installs portions of itself into your current Windows directory to ensure close integration with Windows applications. Any changes you or an application makes are updated for both operating systems. If, for example, you boot into DOS and add a new Program Manager group to Windows 3.1, the change will be reflected in NT, too. Similarly, changes you make in NT, like file associations and changes to groups, migrate backwards to Windows 3.1. As a result, switching back and forth between NT and Windows 3.1 is surprisingly hassle free.

Configuring your NT environment after installation is somewhat different. Just as Windows instituted INI files, Windows NT offers the Windows NT Registry. It's an important structure because it stores most of the configurational data about your system, like the available boot devices and the installed video drivers. The Registry also stores data about software, including associations for object linking and embedding (OLE), dynamic data exchange (DDE), and File Manager. The Registry isn't generally accessible to users as an editable file. To change a video driver, for example, you use NT's Setup program, which makes the changes to the Registry behind the scenes. In NT's strictly controlled environment, anything you want to change should be managed from a configuration menu, and users should never have to resort to editing an INI file.

HOW NT RUNS APPS

Although developer commitment to Windows NT appears to be high, don't expect a large number of NT applications this year. Microsoft plans to deliver 32-bit NT

WINDOWS NT COMPATIBILITY

NT's architecture means hardware headaches for some.

Operating system reliability and security are the main reasons why NT is incompatible with some types af hardware. Proprietary baards with drivers that communicate directly ta system hardware are far less likely ta be supported in NT's initial release, since NT mediates all such interchanges to thwart system crashes.

INTERNAL FAX BOARDS

Leading products: Intel's SatisFaxtian, Supra's FaxModem V.32bis Internal. **Potentiol problems:** NT wan't allow saftware to talk directly ta a piece af hardware. *Nate:* Internal and external modems shauld wark fine.

SCANNERS

Leading products: Hewlett-Packard's ScanJet IIC, Micratek's Lab's ScanMaker 600Z. **Potentiol problems:** Scanners that require proprietary internal cards wan't run under NT. If your scanner can connect to a supparted SCSI cantraller, NT will wark with it carrectly.

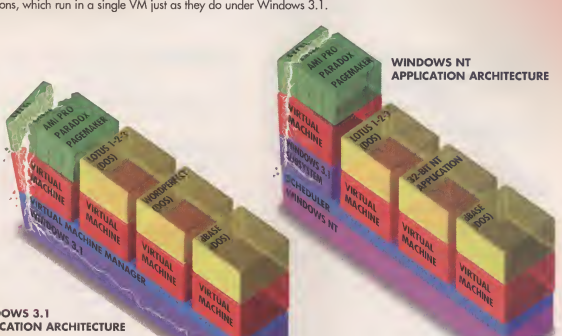
3270 EMULATION BOARDS

Leading products: DCA's IRMA WarkStatian for Windaws NT, Netwark Saftware Associate's DynaCamm Elite, Wall Data's Rumba. **Potentiol problems:** These praducts must all cammunicate directly with a hardware component, but under NT direct access af hardware isn't permitted.

VIRTUAL MACHINES MAKE NT CRASH-PROOF

NT's 32-bit apps each get their own protected environment.

Because NT runs each application in a protected virtual machine (VM), one rogue program can't crash other running applications. This is not true of 16-bit Windows applications, which run in a single VM just as they do under Windows 3.1.



versions of just two of its applications by year's end, and these are likely to be the first major desktop applications to arrive on NT. The rest of Microsoft's desktop applications won't appear in 32-bit versions until 1994. WordPerfect isn't planning an NT version of WordPerfect for Windows until sometime next year. Borland will ship only NT language products this year; NT versions of its productivity applications like Paradox and Quattro Pro are slated for next year. Lotus is gambling that NT will strike out on the desktop because of its hardware requirements and hasn't yet committed to NT versions of 1-2-3 for Windows and Ami Pro.

In the meantime, NT users are going to want to run their existing applications on NT. The big questions are: How fast are Windows 3.1 applications under NT? And how compatible are they? Our tests running Microsoft Excel 4.0, WordPerfect 5.2 for Windows, CorelDraw 3.0, Lotus 1-2-3 Release 2.4, and Borland's dBASE IV 1.5, show a performance slowdown ranging from about 10 to 50 percent.

Since NT is a 32-bit operating system, applications written expressly for it should run noticeably faster than their Windows 3.1 counterparts. To test this, we ran a 16-bit Windows 3.1 version of Image-In-Color Professional image-editing software under Windows 3.1. It performed a difficult image transformation in about 41 seconds. We ran the same 16-bit Windows program under Windows NT, where it took about 42 seconds to complete the task. Finally, we ran the test using the prerelease 32-bit NT version of Image-In-Color Professional under NT. The 32-bit version improved performance dramatically, completing the operation in only 16 seconds.

HOW COMPATIBLE IS IT, ANYWAY?

Generally, we expect Windows 3.1 application compatibility to be good, although not perfect, when NT ships. Microsoft's goal is to make all Windows and DOS applications run under Windows NT, but NT's security architecture will preclude that in some cases.

With a prerelease version of Windows NT, the *PC/Computing* testers turned up a disturbing number of problems with leading Windows 3.1 and DOS applica-

tions. Word for Windows 2.0C stalled out several times during installation, and when it was finally installed, it returned "Out of memory" error messages on attempting to load. Paradox for Windows also crashed on loading. CorelDraw 3.0 wasn't able to save files. WordPerfect 5.1 for DOS encountered a minor hiccup on installation that disappeared during our second attempt. Word 5.5 for DOS had difficulties installing. Finally, Borland's dBASE IV 2.0 for DOS crashed when we tried to load it. Problems like these are to be expected in a prerelease version of an operating system, and many of the Windows apps we tried, including Excel 4.0 and PageMaker 4.0, ran fine under NT. Microsoft has pledged to iron out compatibility problems in the final release of NT. Still, our experience convinced us that buyers should thoroughly test compatibility with the applications they plan to use before committing to NT.

APPLICATION RELIABILITY

One of NT's chief benefits is its application-environment reliability. Just as in OS/2, each program under NT runs in its own space, called a *virtual machine* (VM). The benefit of running programs in virtual machines is that when one crashes, it won't bring down the whole house of cards. Under Windows 3.1, all Windows applications run in the same VM; if one crashes, chances are that others will, too. Using NT doesn't guarantee that applications won't crash since no one's invented the perfect bug-free program. But when an NT application crashes, NT terminates it before it can take other apps down with it. And because each application's memory space is segregated from other applications (and the operating system), applications can't gobble up all available system resources when users still have 8MB of free RAM, as sometimes occurs under Windows 3.1. You can run out of memory with NT apps, but you can't run out of system resources.

A significant drawback to running 16-bit Windows apps under NT, however, is that all 16-bit Windows applications share one virtual machine, just as they do under Windows 3.1. This ensures compatibility with existing 16-bit Windows applications and maintains DDE and OLE functionality between 16-bit and 32-bit applications. But, as in Windows 3.1, you can run out of system resources in NT if you're working with a group of 16-bit Windows applications. And the possibility remains that a single errant 16-bit Windows app might crash NT's entire Windows 3.1 subsystem. This isn't true of DOS applications or NT applications, each instance of which runs as a separate process under NT. But if the performance benefits weren't reason enough to upgrade to 32-bit NT apps when they arrive, greater application reliability should be.

What about DOS? Under NT, the Windows concept of DOS sessions disappears. But from NT's DOS-like command line, you can launch Windows apps, DOS apps, and character-mode OS/2 and Posix-compliant Unix applications just by typing the name of the program. Familiar DOS commands like DIR, COPY, and DEL all work from the Command Prompt just as you'd expect.

LONG FILENAMES

Microsoft's answer to providing support for longer filenames while at the same time working with the DOS file allocation table is as good as it gets. NTFS, NT's file system, breaks the frustrating 11-character file-naming convention. Filenames can be up to 256 characters long and can include spaces and both uppercase and lowercase letters.

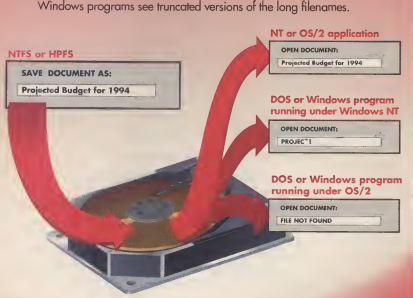
To take advantage of NTFS's long filenames, however, your applications must be running under NT. They also need to be able to handle long filenames—and no DOS or Windows 3.1 application available today does.

To deal with this problem, NTFS automatically generates 11-character filenames that correspond to the long filenames on NTFS partitions. Your DOS and 16-bit Windows applications can still access files stored on an NTFS partition. The only serious downside to NTFS comes into play when you boot into DOS. You won't be able to see any files on an NTFS partition from a DOS directory, for example, since

LONG FILENAMES AT LAST

NT lets DOS and Windows programs use them, too.

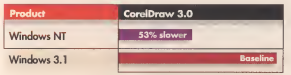
Using a 32-bit file system—like NT's NTFS—you can create filenames with up to 256 characters. Unlike OS/2's HPFS, NT also lets DOS and Windows programs see truncated versions of the long filenames.

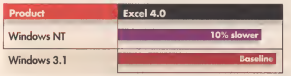


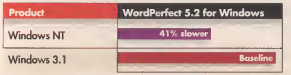
HOW FAST WILL YOUR OLD APPS RUN?

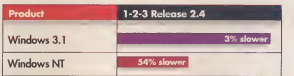
NT exacts a performance penalty with Windows 3.1 and DOS applications.

Under the prereleose version of Windows NT, *PC/Computing*'s tests of 16-bit Excel 4.0, WordPerfect 5.2 for Windows, ond CorelDraw 3.0 showed o performonce erosion of up to 54 percent. DOS progroms, which run only morginally slower under Windows 3.1, olso took o performonce hit. Microsoft promises to improve these numbers in the finol NT release.











DOS doesn't understand the NTFS format structure.

The new file system also enables NT's extensive security features, supports fault-tolerant disk crash recovery by providing disk mirroring and duplexing, increases file-storage efficiency, and improves data-transfer performance. NTFS also enables a feature called *hot fixes* that automatically detects and repairs bad disk sectors on NTFS partitions.

WORKING WITH HARDWARE

For a first release of an operating system, NT's hardware support is impressive. The prerelease version of NT that we examined had been tested and certified with more than 850 single-processor 386 and 486 systems, 21 Intel 486 multiprocessor systems, and 6 R4000-based RISC systems.

At the same time, NT was certified with 642 printer models, 26 network adapters, 6 sound cards, 48 SCSI host adapters, and 20 SCSI CD-ROM drives. NT supports graphics chip sets from ATI, Cirrus Logic, Dell, IBM, MIPS, S3, Trident, Tseng Labs, VESA, Video Seven, and Western Digital/Paradise.

The bad news is that despite the impressive list of supported devices, there were still a number of devices not supported at press time. Other products like non-SCSI scanners and internal fax cards will have problems running their standard Windows 3.1 hardware and driver configurations because they use proprietary device drivers, which aren't permitted under Windows NT's security architecture. Microsoft has worked closely with these vendors to ensure compatibility, but we've yet to see the results of those efforts.

SHOULD I SWITCH TO NT?

Upgrade budgets and timing are the keys.

Budgets will be the biggest obstocle to widespreod NT odoption for most buyers. If you've got on office full of 486s ond a Pentium or two, you're ready for NT—provided ot least some PCs hove 16MB of RAM ond 70MB to 100MB of unused disk spoce.

If most of your apps are custom written, NT is on interesting choice, but OS/2 or Unix might be on even better choice right now because NT's stobility is still unproven. If you use off-the-shelf business software, don't rush to upgrode. Applicotions for NT will oppeor in o trickle, not o flood.

When your favorite Windows app appears in on NT version, it's decision time. A well-written NT opplicotion will be dromoticolly faster ond more relioble thon its Windows 3.1 predecessor.

The bottom line: Be prepared to spend a month or two stress-testing NT with your opplicotions before introducing it on every PC. And don't moke a move until the applications that drive your business hove orrived.

NT



Windows NT Flexes Its Desktop Muscle

Would you trust your business to Windows 3.1? Not when tens of thousands or even millions of dollars are riding on each tick of the CPU. On Wall Street, in giant aerospace and defense establishments, and on enterprise-wide networks where nonstop transaction processing is critical, time is money, and a general protection fault is costly. Under those demanding conditions, Windows NT is an attractive alternative to the DOS/Windows 3.1 combination.

Part of the appeal is sheer horsepower. Because NT doesn't have to perch atop the rickety DOS scaffolding, it can take advantage of superfast RISC-based workstations. The initial release of Windows NT on CD-ROM can be installed on non-Intel systems based on the MIPS R4000/4400 chip, Digital's Alpha AXP chip, and Intergraph's Clipper chip. These RISC architectures offer enormous performance improvements over comparably priced Intel chips, especially in math-intensive applications. Using a preliminary 32-bit version of Excel, we watched a complex macro run side by side on a 66MHz 486DX2 PC and a MIPS R4400, both running Windows NT. On the Intel-based system, the macro executed in a crisp 15 seconds; on the MIPS machine, the same operation flashed across the screen faster than we could follow, finishing in under 5 seconds.

DEC plans to ship 150MHz versions of its Alpha AXP systems later this year, probably for well under $10,000. MIPS, whose chips are found today in laser printers, predicts that R4400 machines will run twice as fast as comparably priced Pentium PCs when they appear later this year. Acer America, NEC, Olivetti, Toshiba, and Siemens have announced plans to build MIPS workstations, and Carrera currently offers a MIPS motherboard.

Windows 3.1 applications and most DOS applications will run unmodified on both the DEC Alpha and MIPS systems. Applications written specifically to run under Windows NT on Intel-based systems will have to be recompiled for the MIPS or DEC architecture, but software developers we talked to say the process is simple and straightforward. One of the first NT apps to appear on RISC platforms will likely be Intergraph's MicroStation CAD software, a $3,790 package that typically runs on $30,000 Sun SPARCstations and will be nearly irresistible when it's available on an $8,000 DEC Alpha box.

SOLUTIONS FOR THREE HARDWARE NIGHTMARES

NT works directly with the system and peripherals to prevent loss of data.

WHAT GOES WRONG	HOW NT FIXES IT
 **Bad Sectors:** One or more sectors of a hard disk fail.	 When NT first formats a disk, it verifies all of the disk sectors, removing bad sectors from use. If a bad sector is found during operation, NT attempts to write the data to a new sector and remove the bad one from use. NT then writes a message in the event log about what it did. This feature is available only on disks formatted with NTFS.
 **Disk Crashes:** An entire hard drive fails in operation.	 The Advanced Server version of NT lets you set up disk mirroring so that one disk contains exactly the same contents as another. While this reduces disk capacity by half, it ensures no data loss if one drive crashes. On Advanced Servers with at least three drives, configure your drives to be a RAID 5 disk array.
 **Power Failures:** A PC equipped with an uninterruptible power supply loses AC power.	 Both versions of NT support uninterruptible power supplies (UPS), which provide backup power if normal power fails. When the UPS detects a power failure, it sends a message to NT via a serial port connection. NT's Server service sends a message to users that a power failure has occurred. After a specified period of time, NT begins a shutdown process.



Lexmark announces laser printers with the most intelligent feature ever:

Lexmark announces the next generation of laser printers. With the built-in intelligence to adapt to your needs today. And grow with you tomorrow.

The intelligent abilities of the new IBM LaserPrinter 4039 family by Lexmark are powerful enough to impress the most serious user. And economical enough to impress the most serious accountant.

Intelligence.



A family of five highly intelligent printers that deliver 10, 12, or 16 pages per minute. And a cost/value equation that sets a brilliant new industry standard.

There are five new LaserPrinters, for 10, 12 or 16 page-per-minute printing. Each has a fast-thinking RISC processor. A compact, space-saving footprint. And an optional snap-on duplexing attachment, for the lowest-priced two-sided laser printing in the industry.

PCL5 and PostScript® compatibility are built in—saving you up to $775 over competitive machines. And delivering plug-and-play compatibility that won't disrupt the way you're printing now. SmartSwitch is built in, too—so your LaserPrinter can choose the right language for each job, automatically.

Sharp, 600-dpi resolution is standard, with Print Quality Enhancement Technology (PQET) for smoother curves. So is Picture-Grade,™ for sharper halftones.

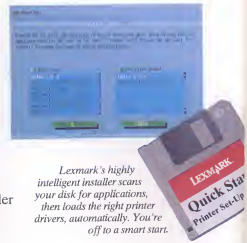
Intelligent memory management lets two megabytes do the work that used to take four. That saves you money.

Drivers for popular software packages are included, along with Lexmark's special driver for faster Windows™ printing. So is

THE NEW IBM LASERPRINTER 4039

Smart enough to do things the only intelligent way: yours.

From the moment you plug it in, the new IBM LaserPrinter 4039 accommodates you—not vice versa. Compatibility with PostScript and PCL5 is built in—something other printers charge as much as $775 for. So is SmartSwitch—to automatically select the right language for each job. And Lexmark's Quick Start installer and printer utilities make set-up brilliantly simple. And adding new fonts and drivers even simpler.



Lexmark's highly intelligent installer scans your disk for applications, then loads the right printer drivers, automatically. You're off to a smart start.

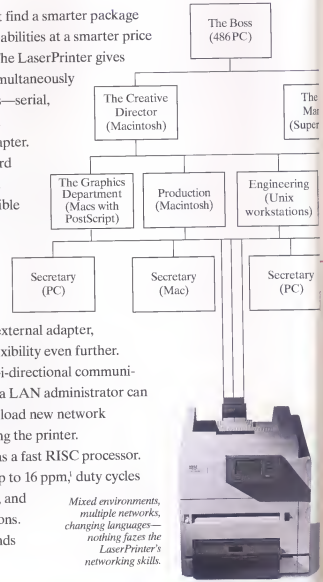
Smart enough to adapt to every corporate culture.

You won't find a smarter package of LAN capabilities at a smarter price anywhere. The LaserPrinter gives you three simultaneously active inputs—serial, parallel, and optional internal network adapter.

Choose an optional INA card (Ethernet or Token-Ring) and you're simultaneously compatible with Novell® NetWare,® OS/2® LAN Server, Microsoft® LAN Manager, *and* AIX®—all on one card. AppleTalk cards are available for Macintosh networks, too. Add our 4033 external adapter, and you expand your LAN flexibility even further.

Lexmark INA cards have bi-directional communications, and flash memory, so a LAN administrator can check printer status and download new network software, without ever touching the printer.

Every LaserPrinter 4039 has a fast RISC processor. And you can choose speeds up to 16 ppm,[1] duty cycles up to 75,000 pages per month, and powerful paper-handling options. Because LAN printing demands brawn as well as brains.



Mixed environments, multiple networks, changing languages—nothing fazes the LaserPrinter's networking skills.

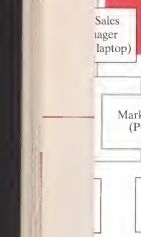
As intelligent as they are, they get even smarter.

Not only is your IBM LaserPrinter on the cutting edge today. It's smart enough to stay there tomorrow. Its internal code is easily upgradable—so you can add new capabilities without paying for a whole new printer. Optional flash memory lets you store frequently used forms, custom fonts, and logos for faster printing—yet change them as often as you like. You can add or change paper-handling options anytime, and move them from machine to machine. All of which makes this not just an intelligent printer. But an intelligent investment.



With our Registered Users Program, you can add new capabilities, without buying a whole new printer.

Exactly h
are Lexmark's n



Smart enough to look after themselves.

The LaserPrinters' built-in smarts deliver a maximum of productivity with a minimum of fuss. SmartSwitch and hot ports automatically select the right emulation and the right port for each job. There's a large, easily readable menu-driven control panel (though the LaserPrinter is so automatic, you may never touch it).

Bi-directional communications let LAN administrators check on the printer's status remotely. Auto paper-



Advanced paper-handling features keep the work flowing, page after page after transparency after card after envelope after...

Lexmark's Quick Start utility, to choose and load the right drivers, automatically. That saves you time.

And a large, intuitive operator display makes installation and use even easier.

Inside your LaserPrinter, upgradable code lets you add new capabilities as they become available, without buying a new printer. Optional flash memory lets you store frequently used forms, logos, and fonts permanently—yet change them instantly.



An optional duplexing attachment fits every printer in the series. Because saving paper and file space is just plain smart.

For LAN users, Lexmark's optional Internal Network Adapter (INA) cards work effortlessly with multiple network operating systems, *simultaneously*. You can even update INA software remotely. Bi-directional communication lets a network manager check on printer status from across the LAN. And the LaserPrinter connects simultaneously to serial, parallel, and optional network inputs, for maximum flexibility.



Right out of the box, the new LaserPrinter is compatible with your working environment, whether you use PCL5 or PostScript.

The new LaserPrinters share multi-size paper trays, and high-yield Lexmark print cartridges, for up to 20,000 pages between changes.

And each one reflects the simple design philosophy of Lexmark, the independent, worldwide company formed from a division of IBM: listen to what customers want. Then build it for them. And stand behind it with quality, support, and responsiveness.



Select an optional INA card, and you're compatible with multiple operating systems—simultaneously.

For your nearest Lexmark dealer, call 1 800 358-5835 (in Canada, 1 800 663-7662). For more information, just look inside.

And see why you really don't need bigger, more expensive, more complex laser printers. Just smarter ones.

IBM Personal Printers by

LEXMARK™

Make Your Mark

FAMILY, BY LEXMARK. PRINT SMART.

Smart enough to see environmental issues from both sides.

Two-sided printing is the wave of the future—so it's an option on every IBM LaserPrinter 4039 today. A compact, efficient duplexing unit attaches in seconds, to put the intelligence of duplexing wherever you need it.

But saving paper is just the beginning. An automatic power saver mode saves electricity while your printer is idle. Lexmark's new print process is ozone free. Lexmark print cartridges last longer, so you'll use fewer. And their cartons double as prepaid return mailers—so you can return used cartridges to Lexmark's Operation ReSource. It wouldn't be an intelligent printer without an intelligent respect for the environment.

PRINTERS THAT THINK. FROM A COMPANY THAT LISTENS.

These new LaserPrinters were designed with the intelligence to anticipate your needs, and respond. So was the company that created them: Lexmark International. Two years ago, we took a former division of IBM, transformed it into a fully independent company called Lexmark, and rededicated ourselves to the art of listening. Customers told us they needed laser printers to do more and cost less. So we built the new LaserPrinter family to establish new industry benchmarks in performance. And, just as important, in value.

Two-sided printing saves paper, storage space, money—and wear and tear on the environment.

Lexmark's 20,000-page print cartridges keep productivity high—and cost per page amazingly low.



IBM Personal Printers by

LEXMARK™

Make Your Mark

PostScript emulation and PCL5 emulation are built in. Saving you up to $775 over some other printers.

PCL5 Language
PostScript Language*

size sensing and multi-size trays handle all kinds of paper—even card stock and transparencies. Lexmark's exclusive Envelope Conditioning[2] fights unsightly wrinkles. And every new LaserPrinter ships with a high-yield Lexmark print cartridge—saving you $25 to $100 over the competition.

With all these conveniences, just about the only time you'll make a trip to this printer is to pick up your finished documents.



ow smart
ew laser printers?

Who says intelligence and good looks don't go together?

Smart as they are, the new IBM LaserPrinters excel in the beauty department, too. True 600-dot-per-inch resolution is standard, with Print Quality Enhancement Technology (PQET) to sharpen text and graphics, and fight the dreaded jaggies. Lexmark's advanced toner technology delivers rich blacks and excellent print quality, without ghosting. 39 Type 1 scalable fonts, 13 scalable Intellifonts,® and 14 bitmapped fonts are all standard.



Introducing PictureGrade: for sharper, smoother images with up to 100 shades of gray.

So is PictureGrade—Lexmark's new technology for maximizing the smoothness and sharpness of images, with up to 100 shades of gray. Which simply means your scanned-in images and photographs will always look exceptionally smart.

Obviously, intelligence runs in the family



Model 10R
Highly intelligent, highly economical desktop printing. *Includes all standard features, plus: 10 ppm; 16 MHz AMD 29200 RISC processor; 2MB memory; 25,000-page-per-month duty cycle; 200-sheet paper tray; 250-sheet output tray; free one-year carry-in service. Includes 10,000-page print cartridge.* ***$1599.***



Model 10R Duplex
The lowest-cost solution for 2-sided printing. *Same as Model 10R, bundled with snap-on duplexing module for the lowest-cost two-sided printing in the industry. Includes 10,000-page print cartridge.* ***$2199.***



Model 12R
High-performance desktop printing. *Includes all standard features, plus: 12 ppm; 16 MHz AMD 29200 RISC processor; 4MB memory; 35,000-page-per-month duty cycle; 200-sheet paper tray; 250-sheet output tray; free one-year carry-in service. Includes 10,000-page print cartridge.* ***$1999.***



Model 12L
For high-volume LAN printing. *Includes all standard features, plus: 12 ppm; 16 MHz AMD 29200 RISC processor; 4MB memory; 50,000-page-per-month duty cycle; 500-sheet input tray, 500-sheet output tray with bin-full sensing; free one-year on-site service. Includes 10,000-page print cartridge.* ***$2899.***



Model 16L
Maximum performance for the busiest LANs. *Includes all standard features, plus: 16 ppm; 20 MHz AMD 29000 RISC processor; 4MB memory; 75,000-page-per-month duty cycle; 500-sheet input tray, 500-sheet output tray with bin-full sensing; free one-year on-site service. Includes 20,000-page print cartridge.* ***$3399.***

One of the smartest features of Lexmark's newest LaserPrinter family is its breadth. And every model, for about the same price as printers that offer less, delivers an array of very intelligent standard equipment:

- PostScript and PCL5 compatibility
- SmartSwitch printer language sensing
- High-speed, AMD 32-bit RISC processor
- Compact footprint
- Up to three simultaneously active input ports: parallel, serial, and optional INA card
- 600 and 300 dpi resolution, both with Print Quality Enhancement Technology
- PictureGrade enhancement for scanned-in images
- Quick Start installation software and printer utilities
- Intelligent, efficient memory management
- Accelerated driver for faster Windows printing.

Interchangeable options include low-cost duplexing attachment, flash memory, INA cards with multiple operating systems, advanced paper-handling options.

One more family trait: the IBM LaserPrinter series comes to you from Lexmark, an independent, worldwide company that develops, manufactures, and markets IBM personal printers, IBM typewriters, related supplies, and keyboards. To find your nearest dealer, or for more information, call 1 800 358-5835 (in Canada, 1 800 663-7662).

IBM Personal Printers by

LEXMARK™

Make Your Mark

[1] 600 dpi throughput is generally determined by page complexity, with a maximum of 8 ppm. [2] Available on 12 and 16 ppm models, MSRP. Dealer prices may vary. IBM is a registered trademark of International Business Machines Corporation in the U.S. and other countries and is used under license. AIX and OS/2 are registered trademarks of International Business Machines Corporation. AMD is a registered trademark of Advanced Micro Devices, Inc. PostScript is a registered trademark of Adobe Systems Incorporated. AppleTalk and Macintosh are registered trademarks of Apple Computer, Inc. Novell and NetWare are registered trademarks of Novell Inc. Lexmark and PictureGrade are trademarks of Lexmark International, Inc. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation. Intellifont is a registered trademark of Miles Inc. © 1993 Lexmark International, Inc.

THE NEW IBM LASERPRINTER FAMILY. BY LEXMARK. PRINT SMART.

GOT A PROBLEM? THROW HARDWARE AT IT!

In mission-critical applications, one CPU is good, two is better, and four or more can be downright liberating. Both the desktop and Advanced Server versions of Windows NT support multiprocessing systems. In its initial release, NT will run unmodified on symmetric multiprocessing (SMP) systems built around up to four identical CPUs. On an SMP system, NT's scheduler can automatically dispatch different threads of execution to different processors, spreading the workload among the available CPUs. This scalable approach lets you throw more hardware at an application if the application has been designed to use multiple threads. At least initially NT won't run on more sophisticated asymmetric multiprocessor designs, where processes can be spun off to a collection of CPUs running at a variety of speeds.

Don't expect multiprocessing to yield supercomputer performance boosts if all you're doing is running today's off-the-shelf business applications. Before an application can really benefit from an SMP system, the developer has to write code that hooks into NT's multithreading support. Industrial-strength "line of business" applications like client/server database back ends will likely lead the charge of SMP-aware applications. Microsoft's SQL Server, for example, has been rewritten to use multiple threads under NT on an SMP system. In preliminary ZD Lab tests using a beta version of SQL Server running on a Compaq SystemPro, we found that performance did indeed nearly double when we added a second CPU to the system (although overall performance was still sluggish). Theoretically, as an application becomes more complex and the network grows larger, you can easily scale up an application by simply adding CPUs.

Out of the box, the desktop version of NT supports systems with one or two processors. By early 1994, expect a bargain SMP upgrade option: an Intel chip that plugs into the OverDrive socket in a Pentium system without disabling the existing chip, effectively creating a two-CPU system. The Advanced Server version of NT will run on computers with up to four CPUs. If you want support for more than four processors, you'll need to find a system vendor that is willing to customize NT for its own multiprocessor design.

NO-FUSS UPGRADES

Installing NT on an SMP system couldn't be simpler. In our hands-on tests, we started with a $12,000 AcerFrame 3000-MP50 multiprocessor system equipped with a single 50MHz Intel 486DX CPU. After confirming that the operating system ran as expected, we powered down the system, installed a second CPU board, switched the power back on, waited patiently for 64MB of RAM to self-test, and then watched as NT discovered the second 486 and booted up supporting both CPUs.

We scaled the system up further, one step at a time, to a $35,000 monster loaded with four 50MHz 486DX CPUs, each with 256K of cache; four 520MB SCSI hard drives, for a total of 2GB of disk space; and 64MB of RAM. There was no fiddling with INI files, no Setup program to run—it just worked with the predictability and stability that harried MIS directors would kill for.

PROTECTING DATA

Lightning strikes. Fingers slip. Hard drives crash. The prospect of losing irreplaceable data is enough to send a chill up even the stiffest spine. Unlike DOS, Windows 3.1, and even OS/2, Windows NT includes a broad array of features that are designed to insulate data from damage—and a powerful backup tool for when disaster strikes anyway.

As long as the disk is formatted using NTFS, NT will watch for bad sectors and map them out on the fly. And because NTFS uses a transaction log to track disk I/O, errors are fixed quickly at bootup; contrast this approach with OS/2 2.*x*, which goes through an agonizingly slow CHKDSK routine every time it boots up after detecting an I/O error.

Windows NT is the first PC-based operating system that includes a powerful, usable backup utility that's fully graphical (although it will also run in command-line mode). It supports a wide range of DAT, 8-millimeter, and QIC-compatible drives, and works with FAT and NTFS file systems, as well as OS/2's HPFS.

WHERE ARE THE NT APPS?

Expect a trickle of 32-bit NT apps this year.

Sources tell us that Windows NT won't be immediately followed by a wave of applications written specifically for it. Instead, most desktop application vendors see NT as a viable server product in the short run, and a platform for optimized desktop applications later.

- **Microsoft** NT versions of all major desktop applications will appear by early 1994.
- **WordPerfect** NT version will appear next year.
- **Borland** Will release language products but no desktop applications (Quattro Pro, Paradox, or dBASE) for NT this year.
- **Lotus** The brass at Lotus doubt that NT will ever be a successful desktop OS. Don't expect 1-2-3 or Ami Pro this year.
- **Approach** Plans an NT version of its database this year.
- **Intergraph** Its MicroStation CAD may be the first big NT application to hit the market.
- **Others** ImageIn, Hilgraeve, Calera Recognition Systems, Contact Software International, Great Plains Software, Ingres, KEA Systems, and Persoft plan to ship NT releases in 1993.



NT's Off-the-Shelf Networking

The basic network capabilities built into the desktop version of NT won't connect your company worldwide, but the simple ability to share applications, peripherals, and files at a departmental level is a powerful advantage—especially the way it's implemented in NT.

Although there have been several versions of Unix for the desktop, NT is the first graphical operating system to incorporate easy-to-use network functions right out of the box. Like Windows for Workgroups, both the desktop and Advanced Server versions of NT provide basic peer-to-peer networking. The networking built into Windows NT is meant to connect small work groups and users at the departmental level, while Windows NT Advanced Server supports enterprise-wide connectivity and interconnectivity with other network platforms.

NT's ability to share files and peripherals is impressive. To share a group of files with a colleague, just highlight the directory in File Manager and click on the Share tool from the File Manager toolbar. Want to share your printer? Open the Print Manager and click on the Share tool, and it's done. At this level, networking within NT is powerfully easy because it's closely tied to the basic functions of the operating system. And there are no arbitrary limits on the number of PCs that can be connected under NT.

NT's networking device support is based on the Network Device Interface Specification (NDIS) 3.0 model and is compatible with Microsoft's other networking products, including Windows for Workgroups and LAN Manager for OS/2 servers. You can also connect an NT client to other NT clients, or to Windows for Workgroups clients or servers. In addition to the Microsoft NetBEUI protocol for fast networking, Microsoft now incorporates TCP/IP connectivity to both versions of the operating system for interconnectivity with many Unix systems and wide-area networking.

During the installation process, NT looks for a network card. Since it uses the same routines found in Windows for Workgroups, it automatically detects most of the cards it supports. If it detects a card that it knows how to deal with, it automatically configures the interrupts and memory addresses.

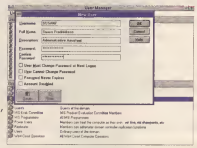
To let you take advantage of its network capabilities right out of the box, NT installs 32-bit versions of its

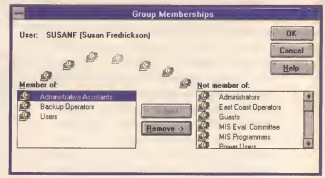
NT'S SECURITY BLANKET

User controls keep PCs under lock and key.

MULTIPLE USERS ON A SINGLE MACHINE

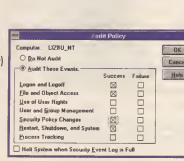
1 Open the User Manager to add your administrative assistant to the list of accounts. The New User dialog box establishes the basics, including user name and password.

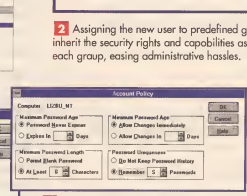




2 Assigning the new user to predefined groups lets her inherit the security rights and capabilities associated with each group, easing administrative hassles.

3 Event logging lets you (as administrator) build an audit trail to track when other users log on and off, which files they access, and more.





4 Define a full security policy with NT's User Manager; you can require password changes, control password length, and enforce use of unique passwords.

work-group applications, Microsoft Mail and Schedule Plus. These versions will work seamlessly with the 16-bit versions found in Windows for Workgroups.

Over time, both the desktop version of NT and the Advanced Server product will become more interoperable with existing network topologies. For example, SunSelect has announced that its NFS product will work with Windows NT, and Banyan has announced it will develop clients for Windows NT that will work with its network operating system. Even DOS clients can connect to an NT machine with Microsoft's $39.95 Workgroup Connection.

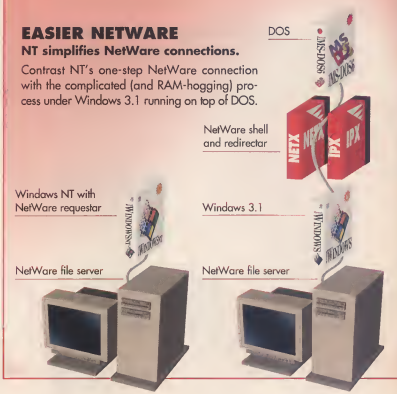
ALL SECURE

Security is a fundamental principle behind NT and a basic tool for making networked environments habitable and productive. Extensive support for security is built right into the NTFS file system, and the first thing you're confronted with when you load the operating system is a security log-on screen that prompts you for a user name and password. If you find that level of security annoying on a standalone PC, you can configure the system not to require a password, but you can't bypass the log-on procedure. NT makes it easy to lock a workstation tighter than a drum. The administrator of an NT machine can set security policies like minimum password lengths and password expiration dates and can maintain password histories. NT can be set up so that it's as open or as se-

EASIER NETWARE

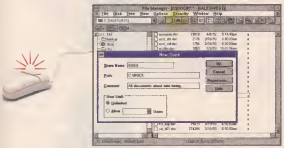
NT simplifies NetWare connections.

Contrast NT's one-step NetWare connection with the complicated (and RAM-hogging) process under Windows 3.1 running on top of DOS.

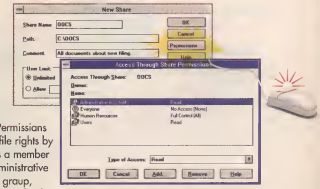


SHARING FILES WITH OTHER NETWORK USERS

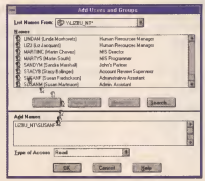
1 Use NT's peer networking capabilities to give ca-workers access to files on your hard drive. Click on the File Manager's Share icon and fill in the blanks.



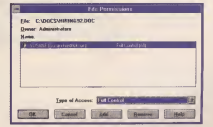
2 Click on Permissions to define file rights by group. As a member of the Administrative Assistants group, Susan can read only the shared files.



3 Fine-tune file access by adding individual users to the list. Drag Susan's name from the list of users; note that by default she has read-only access to the shared files.



4 By removing all other users and groups from the list and redefining Susan's rights to Full Control, you can give her full access to this file across the network.

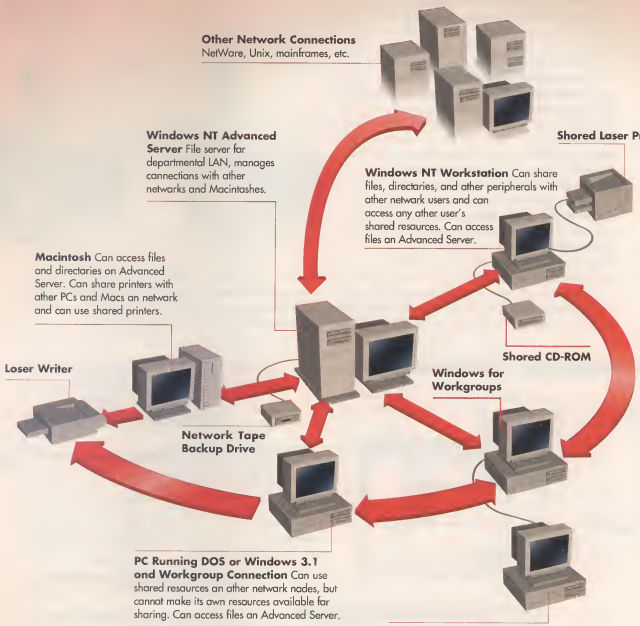


NT

THE DEPARTMENTAL NETWORK

NT connects to virtually every operating system used in business.

One of Windows NT's greatest strengths as a departmental LAN is its versatility. You can connect DOS machines, Windows 3.1 and Windows for Workgroups PCs, and Macs—sharing peripherals and files on a peer-to-peer basis or accessing them via a file server.



cure as you want your business to be.

Because of these built-in security measures, NT makes it possible for multiple users to share a single machine. Once the people sharing a machine are set up with accounts (anyone who logs on with the administrator's password can set up accounts), they can log on and change passwords to make their files and directories invisible to other users—as long as the files and directories are stored on an NTFS disk partition. NT can also save desktop configurations like group boxes, colors, and other settings specific to each user and reload them based on the user name and password.

NT has a sophisticated model for managing group and system functions, and controlling access to system and network resources. The desktop version of Windows NT includes several predefined user and group types, including Guests, Users, Backup Operators, Power Users, and Administrators. Each succeeding user level gains additional rights and capabilities over the preceding level—a sort of security food chain. Power Users and Administrators can share or stop sharing directories and network printers, whereas regular Users and Guests cannot. A user account represents a single user, and a group account controls the rights and capabilities given to all of the users assigned to the group. If the default users and groups NT creates don't suit your needs, you can modify, create, and delete user and group types.

NT extends a broad range of security options to data files, applications, directories, drives, printers, and other sharable resources. For each type of sharable resource, there's a specific set of access rights. A Permissions dialog box lets you choose and apply access rights to users or groups, add or delete specific users to a group name, and search for names over the network. Once you've defined the group of people who should have access to a shared resource, such as a document file, you then assign their level of access. So, for example, each file on your system can be shared by various groups of users, with each group having a different access level.

NT's standard access permissions for files are No Access, Read, Change, and Full Control. Each of these levels defines a degree of access based on eight specific activities, allowing users to run the file if it's a program, change the file's attributes, and delete the file, depending on the permissions extended. At the Read level, for instance, users can run a file if it's an application, but they can't delete it. Special access permissions extend an even finer degree of control with the additional levels of Write, Execute, Change Permissions, and Take Ownership.

Ownership is a unique and fundamental aspect to NT's security model. By default, the creator of a file or directory is its owner, meaning that he or she controls the access to the object. Similarly, a person who shares a printer is its owner. Owners retain their ownership until someone to whom they've granted the Take Ownership right actually takes it. An Administrator can take ownership but not transfer it. Object owners have the right to change permissions.

NETWARE COMPATIBILITY

The vast majority of installed networks are based on Novell's NetWare. So, how well does NT interconnect and coexist with a NetWare environment? It's clear that both companies want to make their products work well with each other's products. Novell is providing the client-side software so that all versions of Windows (including NT, Advanced Server, Windows 3.1, and Windows for Workgroups) can access NetWare servers just as easily as they can access Advanced Server and LAN Manager servers. Novell's part of the equation wasn't complete enough to test at press time, but we have seen this capability at work and are impressed with its potential.

On its own, the Windows NT Advanced Server provides most of the features of a NetWare server, including file and print services. But until NT proves itself, NetWare is still the network operating system of choice. For environments with a NetWare server or series of servers, Microsoft is positioning the Windows NT Advanced Server as an applications server rather than a file and print server. Once 32-bit multithreaded NT applications arrive, combining NetWare and Advanced Server in this way should offer a significant performance advantage all around.

SHOULD NT BE MY NETWORK?

Microsoft competes with proven solutions.

If you're not networked now, you will be soon. The benefits of connecting departmental PCs are too profound to ignore. Sharing files makes day-to-day work more collaborative. Sharing peripherals transforms one-time luxuries like color printers into irresistible bargains. E-mail and scheduling software revolutionize communication.

For most businesses, the up-front cost of networking is the hardest to swallow. A 10-user NetWare license costs $3,195—not including the consultant's time to install and configure the server. By contrast, a single copy of NT will likely cost well under $500, especially at Microsoft's typically aggressive introductory prices. NT has most of the features you'd want in a server-based network. And it's easy to set up.

For the all-Windows office, the ideal setup is on NT server with workstations running Windows for Workgroups. In a mixed environment, with DOS and Windows nodes, LANtastic or NetWare Lite represents a better all-around solution.

When the network *is* the business, stick with NetWare—at least for now—and evaluate NT. Novell's network solution proven under fire; NT's potential hasn't yet been tested in the real world.



Can NT Really Handle Large Networks?

Big networks—*really* big networks—are the true test of any operating system. That's where Advanced Server, the other version of Windows NT, comes in. Microsoft's high-end platform for client-server computing includes all the desktop components of NT, plus wide-area networking capabilities, sophisticated domain-administration tools, advanced fault tolerance, Macintosh support, remote-access software for multiple connections, and connectivity options for mainframes and minicomputers. Microsoft wants you to think of Advanced Server as a replacement for NetWare, Banyan VINES, and Unix. But don't unplug your NetWare servers just yet.

At an estimated price of less than $5,000, Advanced Server is unlikely to fly off the shelves at Egghead or CompUSA. This product is definitely part of Microsoft's long-range strategy, and key components like SNA Services (the mainframe connectivity option) and SQL Server for Windows NT aren't due until at least three months after the first release of NT. Further projects under development at Microsoft include a sophisticated network-management system code-named Hermes, and the Enterprise Message System (EMS), a product for NT that will make it, as the name implies, an enterprise-wide messaging server. However, these won't be available until 1994.

INSTALLING ADVANCED SERVER

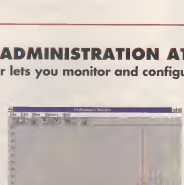
Installing Advanced Server is as simple as installing the desktop version of NT. If you're upgrading from the desktop version of Windows NT, you can install Advanced Server over the existing code, but you'll lose a few configuration settings like groups and local user account names.

Advanced Server includes administrative tools not found in the desktop version of NT, including a User Manager for Domains, a Server Manager to let you administer local or remote servers, and a User Profile Editor to help fine-tune user profiles. Open the User Manager for Domains, for example, and you'll find a slightly different set of account types from those found in the desktop edition. Account Operators can add and recon-

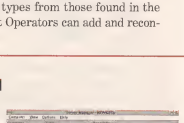
NETWORK ADMINISTRATION AT ARM'S LENGTH

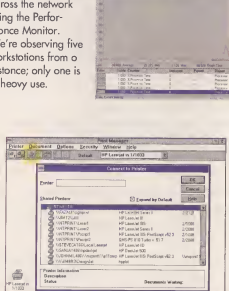
Advanced Server lets you monitor and configure from afar.

1 Trock resource usage ocross the network using the Performonce Monitor. We're observing five workstotions from o distonce; only one is in heovy use.

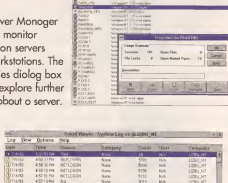


2 The Server Monoger lets you monitor octivity on servers ond workstotions. The Properties dialog box let you explore further detoils obout o server.





3 Connect to o printer elsewhere on the network and control queues remotely using the Print Monoger. Note the fomiliar Toolbors and interfoce conventions.



4 Who's doing whot? As the network administrotor, you can enforce security rules by viewing the Event Log for ony workstotion on the network.

NETWORKS BUILT ON "TRUST"

Managing domain relationships simplifies network administration.

A *domain* is o group of NT Advonced Servers that function as a single system. Relotionships between domains are determined by a concept known as *trust.* With no trusted relotionship between domoins, a user who needs to occess o resource outside the home domain must have on occount in both domoins ond log onto both networks. With o full-trust relotionship, users in both domoins con freely occess resources throughout the network.

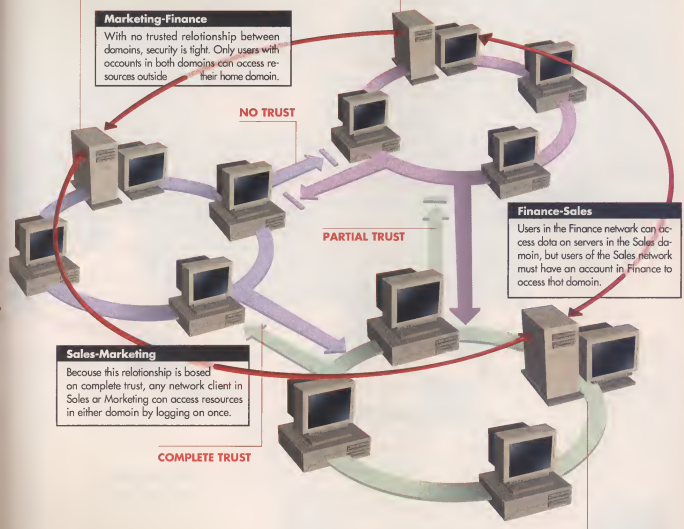


figure accounts on an Advanced Server network, but they can't change a server's configuration. Backup Operators and Print Operators, as the names imply, are allowed only to perform backups and printer queue administration on a server. Server Operators can manage printer and file sharing at the server, back up and restore files to a server, format a server's disk, and change the server's system time. As with the desktop version, Advanced Server allows you to create new groups or delete existing ones to meet your specific needs.

A NETWORK BUILT ON "TRUST"

To understand Advanced Server's network philosophy, it's crucial to understand how Windows NT organizes workstations and servers. Each NT workstation in a work group is connected to an Advanced Server; the servers in turn are organized into *domains* that share a common database of user accounts and security policies. Through a continuous replication process, all the servers in a domain keep identical copies of the account database and security database for the domain. This arrangement makes life easy for the network administrator, who has to create and maintain only one account for each user, instead of managing multiple accounts on multiple servers.

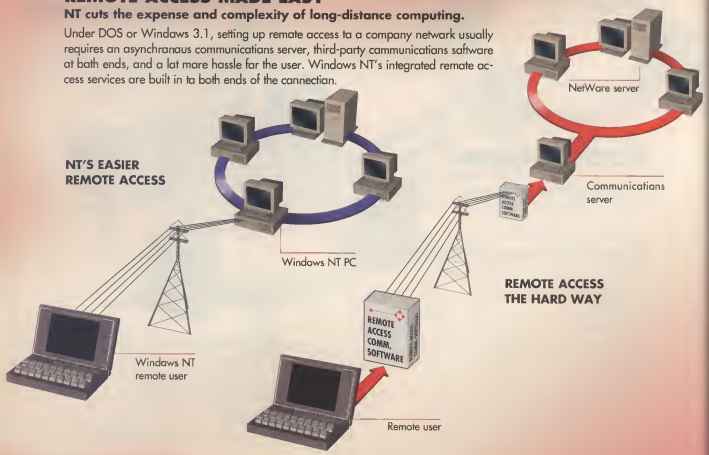
The other linchpin of Advanced Server networking is the concept of *trusted relationships* between domains. In large networks, where data and shared resources are scattered across hundreds or even thousands of servers, connecting to faraway servers can be a nightmare. To ease the administrative headaches, the administrator of an Advanced Server network can create a trusted relationship between domains. At log-on, you assure your home domain that you are who you say you are by correctly entering your user name, password, and home domain; whenever you attempt to access a network resource on another domain that "trusts" your home domain, the domain being accessed will ask your home domain to vouch for you. On a properly implemented network, you should have to log on only once. After you have logged on, the network of NT Advanced Servers will allow you to use any resource for which you have permission. This level of administrative friendliness was previously available only with a global naming service like Banyan's StreetTalk.

Of course, an administrator can also choose not to use trusted relationships between domains. With this technique, it's possible to completely segregate one group on the LAN from another. For instance, if you want to prohibit the Sales Department from accessing the Finance Department's server, the administrator of the Finance

REMOTE ACCESS MADE EASY

NT cuts the expense and complexity of long-distance computing.

Under DOS or Windows 3.1, setting up remote access to a company network usually requires an asynchronous communications server, third-party communications software at both ends, and a lot more hassle for the user. Windows NT's integrated remote access services are built in to both ends of the connection.





OPENING WINDOWS TO A WORLD OF SOLUTIONS

In the world of Windows NT, Intergraph's applications bring a new level of power and sophistication to the technical desktop.

The computer graphics industry has made another leap forward. Under Microsoft's New Technology operating system, popular business programs and Intergraph's technical applications can run alongside each other on the same computer. The same friendly Windows environment appears throughout the applications – word processing, spreadsheets, architecture, civil engineering, mapping, and all the rest. CAD users can now spend time designing and drafting, not navigating through the operating system.

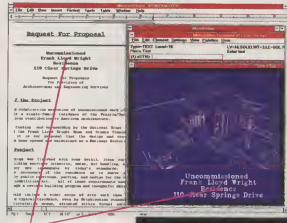
"The Microsoft-Intergraph alliance provides a full range of technical applications, as well as a wealth of personal productivity tools – complete solutions for the technical desktop."

Paul Maritz, Microsoft
Senior Vice President of Systems

Circle 137 on reader service card.



MicroStation is general-purpose CAD software that runs on PCs, Macs, and UNIX workstations. It is a primary tool in Intergraph's solutions for the technical desktop. If you appreciate the economy of PCs but need sophisticated design power, take a look at MicroStation. It means a more productive, more profitable future for you and your company.



LINK TEXT

MicroStation integrates with your favorite Windows business applications.

CAD should give you the productivity edge you need to be competitive in today's business environment. You need a tool that streamlines the process of drafting, as well as a modeler that helps you create virtually any object – fast. You should be able to store design data in relational databases without programming. Your future depends on the ability to share data with your design team and other operations. MicroStation software gives its users this level of proficiency. And keeps them in tune with the best in applications solutions.

"MicroStation includes a robust set of 3D capabilities and gives you a variety of ways to render models."
Infoworld

Intergraph introduces MicroStation Version 5. It refines a product that is considered the state of the art in CAD graphical user interfaces (GUI). In doing so it boosts CAD to a higher level of usability.



MicroStation Version 5 brings renowned integration advantages to designers and engineers who need to run in the Microsoft Windows business environment – Windows, Windows for Workgroups, and Windows NT.

Software that puts you in charge.

Today, *user friendly* means more than easy – it means software that empowers you. You control MicroStation through a graphical command center featuring icon command buttons ... pull-down menus ... tear-away palettes ... multiple, resizable overlapping views. The display is sleek. With no perceptible repaint, Version 5's graphical user interface seems to float over your drafting and design area.

MicroStation runs as an extension of the way you work. Choose from unique *Workspaces* designed for your profession. They configure the graphical CAD desktop for you and manage the computing environment to your needs. Even discipline-specific drafting *styles* are provided. And it's all tailorable: Graphically build your own pull-down menus and palettes. Rearrange fields in dialog boxes. Disengage commands. You've got the power to create the interface that best meets the needs of the task at hand.

CAD software should accommodate the way you think, work, learn – even change your mind. You should be able to select a different dimensioning system right in the middle of a command. Or modify a shape and have all of the dimensions automatically change. Simple actions – like grabbing a line or object – should be so fast that they require no conscious effort. MicroStation performs functions like these as a matter of course. Other CAD software simply can't.

"MicroStation PC is an exceptionally usable, powerful package with such rare and exotic features as nonuniform rational B-splines."
PC Magazine

PC MAGAZINE EDITORS' CHOICE
February 23, 1993
MicroStation PC, 4.0.3



Store information in popular relational databases – without programming!



A powerhouse of features gives you the productivity edge!

MicroStation offers more functionality in one package than any other CAD software. New *dimension-driven design* options help you design intelligently using geometric and dimensional constraints. Apply variables to the constraints and save your design for reuse with different parameters when creating similar objects or parts. These and more new capabilities – like user-defined linestyles and associative patterning and hatching – provide the most complete drafting environment available.

Powerful tools help you create freeform, mathematically precise surface models. Model virtually any object, no matter how complex. Perform trim, blend, fillet, and Boolean operations between surfaces. You've got the simplicity of solid modeling without the overhead.

Visualizing your designs is easy and cost-effective with MicroStation's new photorealistic rendering capabilities. Light sources, shadows, transparencies, depth cueing, anti-aliasing, and bump and pattern mapping help you market your designs. You can even create flythrough animations and play them onscreen for your clients. MicroStation is a powerhouse of features in one package.

The best tool for the '90s production environment.

Users value the way MicroStation performs in the production environment. On large projects, it's a clean-running, fast performer. One user said, "MicroStation is an all-encompassing system ... capable of covering all facets of project management, not just design and drafting."

MicroStation users enhance productivity through real-time data sharing. True file referencing allows each member of a workgroup to easily and safely share files concurrently with others. It's peer-to-peer sharing of design information while everyone continues working – across multiple hardware platforms and networks.

Run MicroStation with other Windows applications. Cut and paste graphics in a Word proposal. Link document text with your MicroStation design file. Drive MicroStation graphics with an Excel spreadsheet. Embed sounds and messages in your design file.

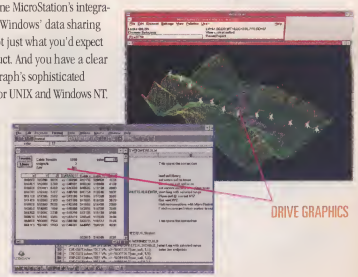
MicroStation Version 5 reads and writes to AutoCAD .dwg format.

"Compared to DataCAD, AutoCAD, and VersaCAD, MicroStation is much faster ..."
Computer-Aided Engineering



MicroStation

All in all, if you combine MicroStation's integration capabilities with Windows' data sharing capabilities, you've got just what you'd expect from a '90s CAD product. And you have a clear growth path to Intergraph's sophisticated application solutions for UNIX and Windows NT.

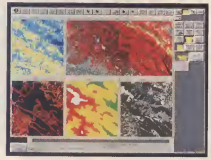


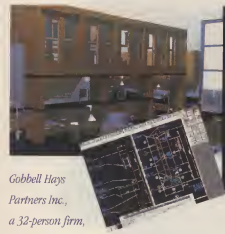
Circle 137 on reader service card.

Beyond the immediate benefits, there are advantages that come from Intergraph's years of experience. In some industries, 25 years is not much. In computer graphics, 25 years is the lifetime of the industry. For almost a quarter of a century, Intergraph has developed computer graphics systems — hardware, software, and support — for industries that rely heavily on maps, engineering drawings, and models to convey information.

Climb the Statue of Liberty, ride Swiss Rail through the Alps, use the 1993 Rand McNally Road Atlas, or take a break with the world's most popular soft drink. In these unexpected places – and hundreds of others – you'll find the results of combining Intergraph's computer graphics experience with users' ingenuity.

With Intergraph's MGE geographic information system, California's Division of Mines and Geology will provide digital maps to enable Californians to determine if they live in risky earthquake or landslide zones.





Gobbell Hays Partners Inc., a 32-person firm, uses MicroStation and ModelView from Intergraph to design laboratories for corporations and universities. Says firm president Ronald Gobbell, "Three-dimensional modeling shows the scientist exactly how his lab is going to look." With MicroStation, Gobbell Hays can customize and reuse cells with symbols of equipment, cabinets, and other basic lab features.

The Intergraph advantage.

The arrival of a powerful new Windows operating environment means that for the first time, hundreds of thousands of microCAD users will have access to the functionality and technical sophistication of Intergraph applications.

Long-term partnerships with customers worldwide.

Intergraph's reputation for top-notch customer service follows the company around the globe as international business steadily increases. Intergraph's extensive customer support network continues to earn top ratings in customer satisfaction surveys. The most recent Daratech *Industry Update* quotes a wide range of Intergraph users satisfied with their systems. Intergraph's track record of technological stability and continuity is important:

Intergraph users range from small offices or departments to large multinational firms, and their projects run the gamut from single drawings to complex aircraft carriers.

"Intergraph has given me a competitive advantage for a number of years."

...

"No other vendor could have given us total binary file compatibility for all these years."

...

"I'm a firm believer that they have the best CAD product on the market."

Daratech Industry Update
November 1992

Olé OLE

Integrate CAD processing with other Windows applications such as Word and Excel by taking advantage of complete support for Microsoft's Object Linking and Embedding (OLE) technology.

Linvatec Corporation uses the high-performance solid modeling technology in Intergraph's Engineering Modeling System (EMS) to design products for least invasive surgery. The process of identifying and developing new and innovative products is fundamental for growth in the health care industry, and Linvatec credits Intergraph systems for providing a strong competitive edge.



Intergraph is the world's largest independent development site for Windows NT applications.

NT

Technical leadership.

The list of disciplines addressed with Intergraph software is one of the longest in the industry – and continues to grow.

• Aeronautical charting • Architecture • Cartography • Civil engineering • Dispatch management • Document management • Electronics design • Energy exploration • Environmental resource management • Facilities management • Geographic information systems • Image processing • Industrial design • Manufacturing • Mechanical engineering • Photogrammetry • Plant design • Publishing • Ship design • Surveying • Telecommunications • Urban planning • Utilities – gas, electric, water



In 39 of the 50 departments of transportation in the United States, Intergraph applications for surveying, civil engineering, and GIS enable the DOTs to design and maintain the nation's transportation infrastructure.

New opportunities arise when you go with the CAD standard.

MicroStation can give you a foot in the door on major projects around the world. For example, the U.S. Army Corps of Engineers and their subcontractors use MicroStation-based applications. On the massive Hong Kong airport project, Intergraph has been named CAD supplier in the four contracts announced so far. Through numerous contractors and subcontractors, Intergraph applications will play a major role in designing and building the new airport and township, as well as the railway that connects them to Kowloon and Hong Kong.

Designed for Windows NT – the new Technical Desktop Series workstations.

Intergraph has traditionally supplied complete software and hardware solutions. In keeping with this tradition, Intergraph offers its own systems designed for Windows NT. They're optimized for CAD immediately out of the box, with full networking capabilities built-in. So it's simply plug-and-play. And with an Intergraph workstation, display clarity, high resolution, and graphics performance make viewing your work a pleasure.

These fast, affordable systems are perfect for running the new technical applications from Intergraph, along with thousands of other applications that run under Windows. And workstations in the Technical Desktop Series are fully interoperable with other systems on your network.

Circle 137 on reader service card.

Low-cost suite of AEC applications

Feature-packed and available at a low cost, Intergraph's MasterWorks applications for architects and civil engineers bring a new level of power and value to the technical desktop. Intergraph brings to the Windows world functions formerly available only in high-end CAD systems. The MasterWorks series includes these applications:

RoadWorks – transportation engineering
DesignWorks – architectural design
CogoWorks – coordinate geometry
FrameWorks – structural modeling
SiteWorks – site design

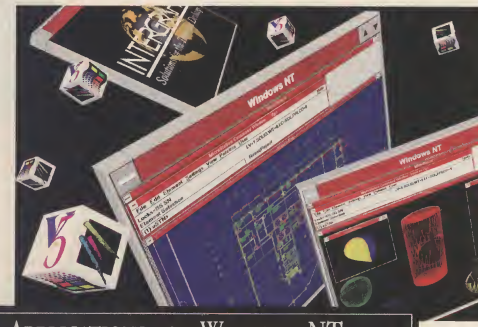
Whatever your project, MasterWorks will empower you to master your design challenges.

Affordable, expandable geographic information systems (GIS)

With the Modular GIS Environment (MGE) solutions for the PC, Intergraph gives you the best of both worlds – the power of the world's leading GIS on the world's most popular computing platform. Using MGE PC solutions, you can build an integrated, powerful GIS without investing large amounts of time, money, or resources. Start with a single PC and add workstations and sophisticated software as your needs grow. Or expand your existing MGE network with cost-effective PC seats. MGE PC solutions include:

MGE PC-I – database creation and project management
MGE Grid Analyst PC – spatial modeling and analysis
MapInfo for Windows – desktop thematic mapping
MGE Project Viewer – read-only database display and query





CALL 800-345-4856 today for an Intergraph Solution Center reseller or sales representative in your area.



APPLICATIONS FOR WINDOWS NT

Innovative technology – once the domain of high-end systems – is now available on the technical desktop. For a more productive future, this is what you need . . .

Workgroup integration.

Intergraph pioneered reference files, the technology that enables each member of a workgroup to easily share designs with others. And, since .dwg files can also be referenced, you can work with AutoCAD-created data in MicroStation. In the Intergraph distributed computing environment, you share information, printers, plotters, and storage devices – and see dramatic savings in time and money.

Integrated applications.

Intergraph's integrated data management architecture provides access to technical information within applications and across disciplines. This means that Intergraph's applications can address an entire project workflow from end to end. Access to information across disciplines is made even easier by the fact that all applications feature the same easy-to-learn-and-use graphical user interface.

Smooth operation between operating systems.

Many of Intergraph's customers operate on networks that include a mixture of workstations and PCs, so interoperability is essential. Because Intergraph application file formats are common across hardware platforms, there are no problems of data incompatibility or translation, and sharing data is easy. Also, basic Windows NT includes all the tools needed for TCP/IP communication with our UNIX-based systems, so users can mix UNIX-based and Windows NT-based workstations in their networks and enjoy smooth interoperability.

Relational database support.

Intergraph data management tools feature built-in interfaces to Oracle, Informix, and other database management products. This support of leading databases in multiple environments enables you to create links to them without programming.

Growth path.

If you choose to upgrade your hardware or add other high-end technical applications, Intergraph gives you a growth path. You can upgrade your system and continue to share files.

Open systems and industry standards.

Your investment in hardware and software is protected by Intergraph's continuing support of major standards for computing, networking, drafting, and design.

Value-added services.

Intergraph also provides support in the form of project implementation, customization, systems integration, training, and worldwide service and maintenance.

Call 800-345-4856 for an Intergraph representative in your area.

INTERGRAPH

Solutions for the Technical Desktop

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domain can choose not to implement a trusted relationship with the servers in the Sales domain.

BELT-AND-SUSPENDERS FAULT TOLERANCE

In addition to the benefits of NTFS, Advanced Server supports two fault-tolerance features for hard drives that will be familiar to veteran NetWare users: *Disk mirroring* (RAID 1) allows you to set up two identical drives as "mirrors" of each other, with the secondary drive keeping an exact copy of all the data that's on the primary drive. If a sector on the primary drive goes bad, NT maps out the bad sector and retrieves the data from the second drive. If the primary drive fails completely, NT automatically switches to the secondary drive. Because each drive exactly mirrors the other, one disadvantage to mirroring is that it requires twice the drive space as a non-mirrored drive.

The second fault-tolerance option is *striping with parity* (RAID 5). If you have between 3 and 32 disks, you can take advantage of NT's support for a RAID 5 drive array. With a RAID 5 drive array, NT automatically stores data and parity information across all of the drives in the array. Should one drive fail, the other drives have enough information to let you continue to work (at a slower pace) while you repair or replace the failed drive. RAID 5 drive arrays are far more cost-effective than disk mirroring, since only a small portion of each drive is used to hold parity information.

REMOTE ACCESS SERVER

Want to connect to a Windows NT system remotely? Dial in to NT's Remote Access Server (RAS), and NT verifies you just as it would on the local network. Once you pass the security authentication check, you can access any network resource for which you have permission, even if it is located in another domain or uses a different LAN topology. Just about anything you can do locally on the network you can do remotely via RAS, including file and print service, SQL database access, and even 3270 emulation.

Unlike Windows and DOS remote-control software that requires you to "take control" of a specific machine on the network, the RAS software connects the remote caller directly to the LAN or to the specified RAS server, and lets the remote user act as a full peer on the network. As far as the remote user is concerned, there should be no difference between working remotely and being attached to the LAN, except for the slower data-transfer speed across a modem.

RAS is available to both NT desktop and Advanced Server users, but the desktop product allows only one user to dial in at a time. With the appropriate hardware, NT Advanced Server allows up to 64 users to dial in at once. Using the standard user-management tools included with NT, a network administrator grants authority for a user to access the system remotely by simply throwing a switch in that user's account profile.

FROM MACINTOSH TO MAINFRAME

Just about every good-size business has at least a handful of Macintoshes scattered throughout the organization. Right out of the gate, NT's Advanced Server will support the Macintosh. At the core, NT's Services for Macintosh includes an AFP-compliant server, a print server, a print monitor, and an AppleTalk stack. Many of these features are already implemented in Microsoft's OS/2 version of LAN Manager but have been refined and improved here. Both IBM's LAN Server (based on Microsoft's LAN Manager) and Novell's NetWare 3.11 and 4.0 provide Macintosh services as an optional add-on.

For a very different kind of cross-platform connectivity, Advanced Server can also serve as a 3270 gateway to IBM minicomputer and mainframe systems. Like SQL Server, SNA Services for Windows NT is an add-on component that Microsoft promises will be available within three months after NT's first shipment. Support is included for AS/400 environments (via 5250 emulation) and for IBM mainframe systems (via 3270 emulation). Any client that can attach to a Windows NT Advanced Server can also connect to the SNA services available for Windows NT.

Client support for 3270 emulation is already well represented with Windows 3.1. Five leading SNA connectivity firms—Attachmate, Eicon Technology, Wall Data, Digital Communications Associates, and Network Software Associates—say they'll ship versions of existing Windows products within 30 to 90 days of NT's release.

IS ADVANCED SERVER READY?

When the stakes are this high, it pays to be conservative.

This year's threefold crisis for network planners is deciding whether to upgrade to NetWare 4.0, whether to introduce Windows NT Advanced Servers into the network, and what timetable to follow.

In decentralized organizations, NetWare 3.11 is already the standard. Upgrading to NetWare 4.0 is a reasonably safe choice. The network kernel is well tested, the new features are evolutionary improvements, and the benefits are well worth the modest risks.

The stakes are higher when you fold NT into the mix. The beta software we looked at had too many bugs and performance problems for consideration in a production environment. Microsoft has promised to iron out those bugs before the final release, but we'll need to see it running smoothly before we integrate it into the network that runs our business.

The bottom line? We believe Windows NT has enormous potential within enterprise-wide networks. But it's unrealistic to expect that potential to be realized in the first release. Now's the time to evaluate NT Advanced Server; this year is not the time to make it a network standard.

NT



FINAL ANALYSIS

THE TRUE COSTS OF UPGRADING TO NT.

Windows NT offers a lot, but it also demands a lot. If it lives up to its billing, it'll be strong competition for Novell's NetWare. But will business buyers want to upgrade desktop PCs en masse? And what's the bottom line on the cost of upgrading?

HARDWARE

NT's hardware requirement is its biggest upgrade expense. The overage 486 Windows PC has 4MB of RAM. Microsoft soys 8MB is the minimum needed to run NT, but you shauld opt for 12MB ar 16MB.

A hidden cost of upgroding to NT is hord drive disk space. The overage NT instollotion displaces about 70MB af disk spoce—more thon three times that of most Windows 3.1 instollotions. Figure an 100MB for Advonced Server.

Most users won't be deleting Windows, since they'll want the option of booting from DOS ond running Windows 3.1. They'll also wont to instoll 32-bit versions of their fovorite opps as saan os they become available—without giving up their 16-bit Windows applicotions.

SOFTWARE

Don't forget the cost of upgroding users to NT opps. Eorly desktop NT odopters are likely to be robid in their desire to ocquire 32-bit NT business opplicotions.

But NT apps will come more slowly ond could well be priced higher thon their 16-bit Windows counterports.

Many 1.0 releoses of Windows pragroms were somewhot limited in their full use of Windows' odvontoges. Simílorly, early NT opplicotions ore likely to be ports of 16-bit Windows opps thot weren't designed to toke full odvontoge of NT's 32-bit copobility or its support of multithreoded aperotions. Yau moy hove to woit for 2.0 NT releoses to see fully revved-up performonce.

TRAINING

Since NT mimics the Windows 3.1 interfoce, most desktop users ore more opt to feel they're facing a minar upgrode thon o whole new operating system.

One challenge to troining ond suppart actuolly stems from the new, powerful, ond possibly confusing capobilities thot NT provides—like long file nomes ond extensive security feotures. Using NT like Windows is easy, but moking full use of it requires getting up to speed.

MIS support of NT is o whole different issue. Despite its Windows 3.1 comoufloge, NT is o completely different operoting system. DOS experience doesn't opply. All the skill most MIS peaple hove gathered in editing INI files is no langer applicoble, either.

WINDOWS

Windows NT won't eclipse Windows 3.1, which hos on installed bose of 25 million.

Loosely dubbed Windows 4.0, the next Windows versian will probobly run 32-bit opplicotions—which moy or moy nat be compatible with NT 32-bit applications. A project code-nomed Coiro will odd on object-oriented interface to NT.

Windows 4.0 will alsa get rid af DOS os a seporote entity. You'll still hove occess to o DOS cammond line, but when yau install Windows you'll be instolling DOS as well.

Microsoft isn't talking much obout Windaws 4.0 or Coiro yet; the company will probobly woit to see how NT does before finolizing the feoture set. Expect to see Windows 4.0 by late 1994.

BEFORE YOU SWITCH YOUR WORD PROCESSOR OR SPREADSHEET, SWITCH ON YOUR VCR.



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NT



FINAL ANALYSIS

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Ask for your free copy today and see why more and more people like you are switching to Microsoft Excel and Word for Windows.

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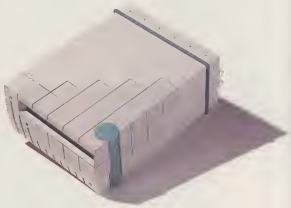


The Four Best Ways

There's a GIGABYTE in your future. Find out how to add the right



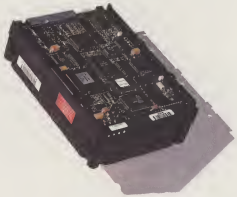
COST: $1,099



COST: $3,195



COST: $130



COST: $1,679

to Get a GIGABYTE

amount of storage for your business needs.

By Winn Rosch

HOW BIG IS A GIGABYTE? A gigabyte is enough disk for a modest multimedia system: about 3,300 uncompressed, 256-color VGA images or about eight hours of compressed stereo sound. According to one developer, it's the hard disk size you'll require to do meaningful work with Windows NT; it's also the level of storage you need for a small business network. As far-fetched as it sounds, a gigabyte is likely to be the storage you want in your PC for serious work—if not today, then soon.

How big is a gigabyte? Measured in dollars, it can be smaller than you think. We found that a gigabyte isn't just something you'll need soon—it's something you can afford today. And best of all, a gigabyte doesn't have to be a big hassle. The hardware is easier to install and run than the typical food processor, and the software solutions are no more confusing than a recipe for fudge. In fact, choosing and managing a gigabyte are more trouble than setting one up.

As with a billion dollar fortune, how you handle your gigabyte of storage determines how soon you and your data are parted. You could drop everything into one account—a giant 1GB hard disk—for the utmost in convenience and speed: It's an easy one-shot investment, but it's vulnerable to disaster. To be safe, you could split your gigabyte into several smaller account-equivalent, removable magnetic cartridges, which each put a mere 100MB or so on the line. If you need to move quickly and stay on your feet, you might sink your investment in negotiable securities—large, standardized magneto-optical cartridges that will move a gigabyte between PCs easily. Or you can extend what you have through simple counterfeiting—simulating more mass storage than you actually have by using disk compression.

What you make of your gigabyte is another matter. You could wield it wisely and make every last byte count, or you could lapse into profligacy and waste your space with a profusion of backup files and outdated program versions.

Fortunately, megabytes are more forgiving than money when it comes to sloppy management. You can always reformat your mistakes away and start with a fresh gigabyte. But the biggest challenge is still getting your first gigabyte. Here are the four best ways we've found.

WHY YOU NEED A GIGABYTE

The days of the 20MB hard drive are long gone.

You always need more. Back in 1983 (before the arrival of disk-hogging Windows), a whole suite of business applications occupied just 1.7MB of disk space. Today that figure has increased by more than a factor of 30.

1983	
DOS 2.0	122K
WordPerfect 2.30	439K
Lotus 1-2-3	1,024K
dBASE II	137.5K
Total	**1.7MB**

1993	
DOS 6.0 and Windows 3.1	14.5MB
WordPerfect for Windows 5.2	12MB
Lotus 1-2-3 for Windows	10MB
Paradox for Windows 1.0	16MB
Total	**52.5MB**



PHOTOGRAPHS BY FRED STINSON

THE 150MB SHUFFLE

Problem: You need a billion bytes, but not all at once. You want a gigabyte for archiving and exchanging files and for running programs, but you have a tight budget.

Solution: *Iomega Bernoulli MultiDisk 150*

YOU CAN SATISFY YOUR giga-need even if you only have a megabyte budget by opting for cartridge-based storage. With a cartridge disk, you can put your gigabyte on the pay-as-you-go plan, increasing your megabytes of mass storage into giga-territory and beyond with installments. The basic strategy is simple but elegant: Instead of investing in one big drive, opt for an affordable cartridge unit that lets you add additional megabytes by the hundreds in cartridge form when you later need them.

Of today's cartridge drives, Iomega's 150MB Bernoulli MultiDisk offers the best combination of performance, ruggedness, and compatibility. The latest Bernoulli drives are available as internal or external units with a built-in power supply or cables to draw power from your PC. They also let you keep up to 150MB online at a time, and a single cartridge will handle the largest program and data files you're likely to use. To load another megaprogram, you just slide in another disk. Ultimately, you can break the gigabyte barrier yet pay only half the price of a billion-byte hard disk.

Because it's new, the Bernoulli 150 is still costly. Each cartridge—you'd need seven at 150MB each to reach 1GB—will add $245 to the $1,099 price of the basic internal drive ($1,122 for the PC-powered version with one drive and external case; $1,225 for self-powered transportable version with single drive and external case; and $2,499 for self-powered dual version with two drives and external case). If you plan to build your gigabyte gradually, however, you're likely to witness declining prices. For the moment, it's less expensive to buy the Bernoulli 90 Pro, which limits online capacity to about 90MB (about 11 cartridges to a gigabyte), but which is available now for a street price under $500.

The advantages of cartridge drives extend far beyond price. Because cartridges are removable, they offer security, exchangeability, and backup possibilities that conventional hard disks don't. When you can pull data out of your PC, you can lock it up for safekeeping. A cartridge system is also the perfect backup device, providing as many copies of important data as your paranoia demands.

Surprisingly, transferring data in cartridge form can be more economical than electronic exchange. For example, you can pack 100MB in a cartridge and ferry it around the world with greater reliability and less cost than you can online. Moreover, slipping files into an air-freight pouch isn't any slower than dialing for data. If you estimate throughput to be about 1K per second for typical high-speed modem transfers (assuming today's V.32 9,600-bps standard), by the time a cartridge in an overnight package arrives at its destination 16 hours later, you'll have moved only about 60MB electronically.

The Bernoulli cartridge itself is based on ingenious technology. Iomega renders the old-fashioned floppy disk remarkably fleet by stabilizing its spin with an air-pressure gradient created by a fixed plate using the Bernoulli effect (air pressure is inversely proportional to its velocity). In short, Iomega figured out how to spin a floppy disk as fast as a hard disk.

Bernoulli disks do eventually wear out, but the most recent machines minimize the problem, and Iomega stands behind its media with a five-year warranty. Moreover, you don't have to worry about wearing out the cartridges you lock in cold storage.

THE BEST CARTRIDGE



Bernoulli MultiDisk 150

Iomega Corp.

Internal, $1,099

1821 W. 4000 South
Roy, UT 84067
(800) 777-6179
(801) 778-1000

Bottom Line: *The 150MB MultiDisk provides storage on the installment plan, combining performance, sturdiness, and security.*

In addition to the 150MB cartridges, the newest Bernoulli model is compatible with a variety of storage capacities on its 5.3-by-5.4-by-0.35-inch cartridges. It reads and writes 150MB, 105MB, 90MB, 65MB, and 35MB cartridges and can even read old 44MB Bernoulli cartridges.

Iomega supplies all the necessary software with the drive. An installation program automatically updates your CONFIG.SYS file and copies the drivers you need to your boot disk. Initializing a Bernoulli takes seconds, as opposed to the minutes other cartridge systems require.

Besides Bernoulli cartridge drives, you'll find a number of other choices as well. One alternative—the floptical cartridge—resembles the Bernoulli in that both are based on flexible-disk technology. But the similarity ends there. Packing only about 20MB per cartridge disk, flopticals can't match Bernoullis in capacity or speed. The real competition comes from two other compact cartridge

systems with capacities in the 100MB range: SyQuest cartridges and 3.5-inch magneto-optical (MO) cartridges. Each has its strengths and applications.

SyQuest, which sells systems through its SyDOS division (800-437-9367), takes a traditional hard disk approach but puts its platter into a plastic shell you can pull out of the drive. In the $1,299 SyDOS 88e that we tested, flyweight magnetic heads float above (and below) the spinning disk platter on a cushion of air. Capacities of the 5.4-by-5.4-by-0.5-inch cartridges are as high as 105MB with the latest drives, which can also read and write to the 88MB and 44MB cartridges created by other companies. (Our test 88e topped out at 88MB.)

Magneto-optical cartridges use laser beams to fine-tune the aim of magnetic heads, which enables them to achieve high storage densities. The sharp focus of the laser beam lets MO systems squeeze about as much data into a 3.5-inch cartridge as fits on a 5.25-inch disk under the Bernoulli or SyQuest all-magnetic cartridge systems—128MB under an ISO (International Standards Organization) standard.

Putting Them to the Test

When we pitted the $1,895 PMO-130 magneto-optical system from Pinnacle Micro (800-553-7070) against the Bernoulli, we discovered a few features in the PMO-130's favor but not enough to award it the winning spot.

The 3.5-inch MO cartridges are rugged (on a par with Bernoullis). Unlike the magnetic cartridges, MO disks are also standardized (by the ISO), and several companies make them, which avoids single-source technology pitfalls. But this convenience is outweighed by expense and slower speed. Drives cost two to three times as much as comparable magnetic-technology machines. Their heavy optical head assemblies are less responsive than lightweight magnetic heads, resulting in a DOS access time nearly 20 percent slower than other drives.

Performance separates the SyQuest system from the Bernoulli as well. Although the two achieve similar access times, the SyQuest test system's data throughput was about 25 percent slower, principally because of the Bernoulli's faster SCSI controller—a 5MB-per-second Adaptec 1540B vs. SyQuest's 3MBps Adaptec 1522. Another drawback is poor durability—the SyQuest cartridges won't wear out like Bernoullis, but they are delicate, requiring protected cases for transport and storage.

While the Bernoulli Box delivers the best compromise of capacity, performance, and price for most users, in some circumstances the other small cartridge media make sense. If you do publishing, you'll favor the SyQuest cartridge because of its wide acceptance among service bureaus and Macintosh users. In coming years, the MO cartridge may take over this role, but when you couple future uncertainties (unforeseen technology may make both MO and SyQuest obsolete) with the substantially higher cost of the drives, the conservative route appears best.

THE SYSTEM APPROACH

Take the prepackaged route.

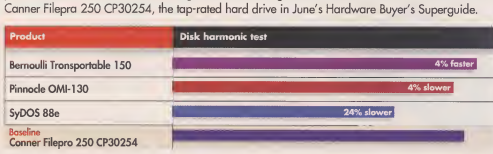
Although they're sometimes difficult to find from direct vendors, you can buy individual Iomega, SyQuest, or 3.5-inch magneto-optical drives by themselves, just as you might buy a hard disk drive. But you probably won't want to. Although all three drives plug into standard SCSI host adapters, they also require their own software to take full advantage of their features.

Consequently, for this comparison we chose prepackaged systems—exactly as you should. SyQuest sells packages through its SyDOS subsidiary, and Iomega and Pinnacle sell complete packages themselves. Three-and-a-half-inch MO drives from other manufacturers are often available in packages from system integrators. The package approach assures you'll have everything you need—from cable to cartridge—when you start up your system.

BERNOULLI BEATS MAGNETO-OPTICAL CHALLENGERS

And its performance is comparable to that of a hard disk.

Iomega's Bernoulli MultiDisk 150 proved the leader in our disk-harmonic test, which measures the performance of a disk in transferring data files as large as 32MB. As a baseline, we've used the Conner Filepro 250 CP30254, the top-rated hard drive in June's Hardware Buyer's Superguide.



THE MIGHTY MO

Problem: You need a permanent medium for storing and transporting files that are megabytes or hundreds of megabytes large.

Solution: *Pinnacle Micro PMO-650*

YOU CAN PUT A GIGABYTE in your pocket with a full-size 5.25-inch magneto-optical drive. These clever combinations of laser beams, magnetic fields, and high-tech materials can squeeze a full gigabyte into a 5.25-inch cartridge. You can transport them without fretting about their safety because the tough MO medium resists most office and travel terrors, including X-rays, magnetic fields, and dust contamination. And widely accepted standards for MO cartridges make it possible to exchange files with cohorts and conspirators.

Quite naturally, MO has found its niche wherever portability and security are mandatory and whenever files encroach into megabyte territory. For backup and storage, MO beats the traditional archive medium—magnetic tape—in both the long and the short term. MO media last longer. While most MIS departments refresh their tapes every few years, such precautions are unnecessary with MO. In addition, MO delivers relatively quick access once you slide a cartridge into the drive. Although it's slower than a conventional hard disk, you can still locate any byte in milliseconds instead of waiting minutes for shuttling tape. These attributes make MO the best choice for preserving CAD drawings and graphics, transporting archives, and locking gigabytes in safe storage.

Unfortunately, you can't tap into all the potential of MO technology with a single product. And with most MO drives, you won't get the performance demanded by today's dominant 486-based PCs. Pick the Pinnacle Micro PMO-650, however, and you'll get capacity approaching a gigabyte and performance approaching that of a conventional hard disk—it's not perfect, but it's the best compromise available today.

MO technology long ago promised to be the replacement for the hard disk. Unlike other optical disks—such as CD-ROM and WORM (write once, read many)—MO is rewritable, so you can change your mind thousands of times. Its optically assisted magnetic writing achieves data densities beyond the reach of today's magnetic drives, giving the single platter of an MO cartridge the capacity of a stack of magnetic disks. A single 5.25-inch disk stores between 650MB and 1,000MB. In addition, the laser-based system doesn't require disk contact or a fragile flying head (as traditional magnetic disks do). The recording surface is sealed under clear plastic, so it's naturally resistant to contamination. The special MO medium is about ten times more resistant to erasure than a conventional hard disk is, so while the data packed on a cartridge is expected to last at least ten years, it could last a century.

The Speed Issue

Despite its promise, however, MO has yet to put a dent in the dominance of the traditional hard disk. Most MO drives are just too slow, with access times three to four times slower than those of hard disks. MO is, in fact, optimized for transfer speed—that is, reading sequential data, typically large files—rather than for access speed, because it uses a single spiral track per side instead of multiple concentric tracks on a hard disk. Even so, most MO drives transfer information at about half the hard disk speed, partly because most MO disks spin at half-speed—1,800 revolutions per minute compared to the 3,600 rpm of most hard disks.

But Pinnacle's PMO-650 is no ordinary MO drive. It adds life to the laggardly medium with a mixture of clever mechanical design that doubles the spin speed of MO platters (to the hard disk speed equivalent of 3,600 rpm) and optimized electronics that include a hardware cache to simulate hard disk performance. With the PMO-650 you get the gains of MO without the pains. It lacks only maximum storage capacity.

The capacity of any MO cartridge system is a murky issue. While shuffling cartridges promises unlimited storage, MO's online capacity is more modest than the widely promoted numbers indicate. Unlike other cartridge media (including 3.5-inch MO cartridges) and CD ROMs, the big 5.25-inch MO disks spread their data across two sides. Only half their total capacity is online at a time. You have to physically flip a cartridge to gain access to its other side.

The generous numbers that appear in model designations also misrepresent the total two-sided capacity. Run CHKDSK even on the exemplary PMO-650, and all you'll find is about 282MB per side (give or take a few

THE BEST MAGNETO-OPTICAL DRIVE



PMO-650
Pinnacle Micro
$3,195

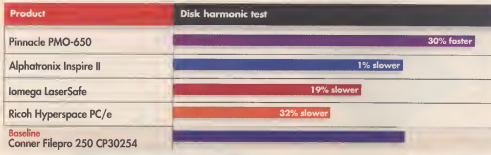
19 Technology
Irvine, CA 92718
(800) 553-7070
(714) 727-3300

Bottom Line: *The PMO-650 magneto-optical cartridge gives you storage that's fast and exchangeable, but the technology will cost you.*

PINNACLE'S PMO-650 RISES TO THE TOP

It's faster than the average magneto-optical drive.

Thanks to its hard-disk emulation and double-speed spin (which requires special media), the Pinnacle PMO-650 topped our disk harmonic test. Its performance does not match that of the 1GB hard disks we reviewed, but it outclasses all other magneto-optical products.



megabytes to allow for bad tracks). The so-called gigabyte cartridges actually hold about 440MB per side.

MO compatibility can also pose problems. Although the so-called 650MB cartridge falls under the rubric of an ISO standard, the gigabyte cartridges do not. High-speed (3,600 rpm) drives may require special cartridges to achieve better performance. Moreover, the ISO standard pertains only to the hardware and doesn't carry over into areas such as DOS partitioning. As a result, although MO cartridges can be exchanged between various drives, there's no guarantee that a cartridge written on one drive can be read by another.

Paying the Price

One further MO drawback: Gigabyte-size removable cartridges impose a price penalty. For example, the PMO-650 lists for $3,195 ($3,394 with one cartridge), about 50 percent more than a gigabyte hard disk. But as with all cartridge drives, the cost per megabyte of big MO storage plummets as you invest in more media. You need only one drive to handle all the cartridges (and gigabytes) you can afford. At the cartridge level, big MO delivers more bytes per buck than any other spinning medium (tape beats it but it's quite slow).

This list of shortcomings is a caveat, not a condemnation. Before you can take advantage of MO technology, you need to know its limitations. Big MO fits many of the same applications as other cartridges, but it takes the lead when you need more—more online storage and more storage per cartridge. Performance suffers somewhat from the more robust mechanism required for the bigger disks, but the PMO-650 pushes it up to near magnetic disk standards.

If you need optimal cartridge compatibility, investigate Alphatronix (800-849-2611, 919-544-0001), which offers an MO drive that's a very good linguist. Its $4,495 Inspire II can make sense of most DOS-based MO formats, but it took a distant second in our performance tests.

While the Pinnacle PMO-650 is no panacea—no MO drive is—it can give you unlimited and exchangeable gigabytes with better performance than competing MO systems.

GIGABYTE-SIZE SAFETY NETS

Tape drives big enough for the job.

A huge hard disk has one drawback: When all your storage is online, it's on the line, too. But at the gigabyte level, a simple backup can be formidable.

Two tape solutions have kept up with hard disk size and offer multiple gigabytes of backup room at great prices. QIC-1000–standard quarter-inch cartridges puts a gigabyte in a DC6000 package. Digital audio tape (DAT) drives pack 2GB into tiny cartridges using VCR-like helical scan recording, and with hardware data compression will hold 4GB.

While quarter-inch cartridge tape eclipses DAT's transfer rate, DAT's integrated hardware compression is tops for compact storage, capacity, and retrieval speed. It also narrows the gap between DAT's transfer speed and a quarter-inch cartridge's. When we pitted Colorado Memory Systems' 2GB PowerTape 4000 PT-50 (quarter-inch tape) against the WangDAT DAT 4000, the latter did quite well. Back-up time to DAT for a gigabyte was 36 minutes and 37 seconds. The 2GB PowerTape with software compression took 24 minutes for the same data.

When uncompressible data was substituted for the gigabyte of test files, backup time increased. The Colorado drive took 1 hour and 26 minutes to copy the uncompressible gigabyte to quarter-inch tape; the WangDAT system took 1 hour and 52 minutes.

What's best? For speed it's quarter-inch cartridges. For compact storage, DAT's the way to go.

BIG DISKS

Problem: You need huge online storage so that you can access data instantly.

Solution: *Maxtor MXT-1240S*

HARD DISKS DELIVER the quickest performance of any mass-storage system. At the gigabyte level, the best hard disk is the Maxtor MXT-1240S.

In general, the larger the hard disk, the quicker the access time. Consequently, big drives are the best choice for disk-intensive applications. They're also the best choice for network servers—keeping everything online without intervention (cartridge or tape changes, for instance) and also offering fast access for workstations.

There are other benefits. Disk makers lavish attention on their top-of-the-line products. With gigabyte-size drives many makers have increased spin speed from 3,600 rpm to as high as 5,400 rpm. (According to manufacturers, speeds higher than 5,400 rpm are impractical.) As a result, data-transfer rates are higher, and bigger disks are backed better. Gigabyte-size products often have five-year warranties. Many have mean-time-between-failure figures in excess of 100,000 hours (over 11 years), with some as high as 350,000 hours (nearly 40 years). All the drives we examined use the SCSI interface. (IDE has problems at the gigabyte level, although Micropolis now offers a 1GB IDE drive—the Model 2112A, a twin of the SCSI-based 2112 we examined for this article—along with installation software and drivers that put the whole gigabyte online as one drive.)

Differences between drives at the gigabyte level are small, as are the drives themselves—a new gigabyte-size drive fills a full-height 3.5-inch drive bay. Performance puts any last-generation drive to shame. The Maxtor MXT-1240S beat the competition handily in access time and throughput measures. The Seagate ST11200N took second place.

Both the Maxtor and the Seagate drives have similar capacities—an odd turn considering the Maxtor's claim of 1,240MB to Seagate's 1GB. The Maxtor's shortfall is its host adapter. The Maxtor delivers full capacity in environments such as Novell NetWare, but with most host adapters and DOS, you'll be paying for unusable space.

THE BEST HARD DISK



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Bottom line: *The Maxtor MXT-1240S proved the fastest of the SCSI hard drives we tested.*

We found three other drives in the 1GB class—the Hewlett-Packard C2247, the Quantum ProDrive 1050, and the Micropolis Model 2112—were all top performers and easy to install. Each has the heft and sturdiness of a brick and runs as fast as a 486. Any drive will do; our pick is the top drive in a closely matched group.

HUGE AND FAST: GIGABYTE HARD DISKS

When it comes to hard drives, bigger really does mean better.

Maxtar's MXT-1240S was the leader in ZD Labs' disk harmanic test, which measures a drive's perfarmance in sequential and randam reads and writes for files ranging in size from 256K to 32MB. The Seagate ST11200N took secand place.

Product	Disk harmonic test
Maxtor MXT-1240	196% faster
Seagate ST11200N	162% faster
Micropolis2112	140% faster
Quantum ProDrive 1050	132% faster
Hewlett-Packard 2247	128% faster
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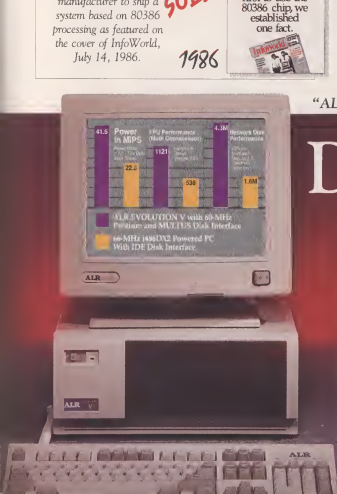


Being the first to use the 80386 chip, we established one fact.

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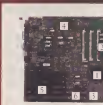


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Circle 142 on reader service card.

DOUBLE OR NOTHING: DISK COMPRESSION

Problem: You have gigabyte-size storage needs but a budget half as big.

Solution: *DOS 6.0 DoubleSpace disk compression*

DISK COMPRESSION IS the free lunch of mass storage. Run some software, and your hardware shortcomings disappear as your disk capacity appears to double.

With compression, obtaining a gigabyte means buying only half as much hard disk and then simulating the rest with software. Or if you already have a big disk, you can avoid investing in another—compression can double a half-gigabyte disk's capacity, and you save nearly $1,000 on the cost of a new drive. Think of compression as the byte equivalent of a billion-dollar savings bond, one that says 1GB on the front but costs only half as much.

Three products lead the disk-compression field. Two of them, SuperStor Pro from AddStor and Stacker 3.0 from Stac Electronics, are freestanding utility packages. One compression solution, DoubleSpace, is a feature built into MS-DOS 6.0. Our pick is DOS. Not only do you get a better value, but DoubleSpace is also more convenient to set up and use.

The magic underlying data compression relies on the principle that most storage systems were designed for convenience and speed rather than for maximum capacity. They store information in the form that your programs can most readily use, so that your applications can read it directly without time-consuming conversions.

These relatively primitive storage designs don't make sense with today's 486 microprocessors, where waiting for disks to deliver data is the principal performance roadblock. With a 386 or better processor, there's usually no penalty for preprocessing data to maximize storage capacity. In fact, compression processing can actually speed data transfer, cutting the amount of data your disk drive must process. With highly compressible data, disk transfer speed can accelerate by 50 percent. For example, in our test system, writing a compressible file took 6 minutes without compression, 4 minutes using Stacker 3.0, and just slightly more than 4 minutes with DOS 6.0.

On the other hand, unsuccessful compression processing adds overhead to disk transfers and can substantially slow your system. A 128MB file that couldn't be compressed required only 7 minutes to write without compression, but took over 15 minutes with Stacker 3.0, and about 13 minutes with DOS 6.0.

Disk compression uses some of the same packing principles as file-compression programs like ARC and PKzip but works on the fly—it invisibly compresses files whenever you write to disk and surreptitiously decompresses them during reads.

All disk compressors use pattern matching. The compression program scans the data you send to disk for recurring patterns at the byte or block level and assigns each complex pattern a simple *token*, or symbol. Once the token and its *definition*, or the original pattern, are stored, any subsequent occurrences of the pattern are saved as the token alone. When decompressing the data, the program simply substitutes the original data for its token.

Mileage May Vary

The effectiveness of this strategy varies with the data being compressed. Bit-mapped graphics files often include large areas with little detail that compress by factors of eight or more. Compressed graphics files (for example, the GIF files you might download from a bulletin board) already have the fat rendered out, so they don't compress at all. On average, you can expect to come close to the doubled capacity that data compression software vendors promise. (See "How Much Space Can You Save?," facing page.) You can expect similar levels of compression from all programs. Stacker can deliver more if you take extra time for follow-up file crunching.

As with every supposedly free lunch, disk compression carries a price—it complicates operations. With new compression programs, that shortcoming is less severe, but it still can take a toll on your patience.

The most serious drawback to compression is the hassle of loading and managing software drivers and utilities. Interaction among drivers can make every change to your system setup files a headache as the compression package tries to outmanage your setup efforts. You also get the pleasure of mounting and unmounting drives on occasion, a procedure abandoned along with mainframe computers. Worse, the magical compression programs alter your mass storage into a

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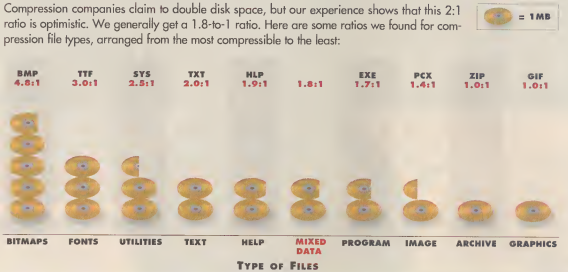
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Bottom Line: *Microsoft's MS-DOS 6.0 DoubleSpace disk compression is the best value; it's easy to set up and use, and it's built into DOS 6.0.*

HOW MUCH SPACE CAN YOU SAVE?

Disk space gained by compression varies widely with file types.

Compression companies claim to double disk space, but our experience shows that this 2:1 ratio is optimistic. We generally get a 1.8-to-1 ratio. Here are some ratios we found for compression file types, arranged from the most compressible to the least:



form that's incompatible with the outside world—it can change the value of every byte you store, which is great for security but a problem if something goes awry. If your compression program doesn't load properly or if your disks don't mount, all the programs and data you've compressed will be inaccessible. Keep in mind also that the drivers for disk compression take up memory space—about 43K to 45K of RAM. You can minimize the impact on your system, however, by loading them into upper memory.

Some programs are more obnoxious than others; they may assume they are smarter than you are, which can make system configuration changes frustrating. Stacker 3.0 is the most tiresome, automatically undoing the changes you make to your setup files if you're not careful and even resurrecting intentionally deleted files. (You can avoid some hassle by customizing your setup, but the extra steps make the complex software even more forbidding.) DoubleSpace caused the fewest problems, mostly because it's tightly integrated with the DOS 6.0 kernel. It sets itself up before CONFIG.SYS loads, so you don't have to worry about multiple copies of your boot files.

A Matter of Trust

Because data compression is a form of coding, files are stored in a form that's unreadable without the decoding algorithm. In other words, once you've squeezed your data onto disk, you'll need the original software (or something compatible) to pull data off. That worries some folks who are reluctant to trust their data to the vagaries of software companies. Moreover, a single bit-error in a file can multiply and make reconstruction difficult or impossible. Fortunately, these three products are so widely accepted that such worries should be groundless.

More important is whether the software works the way you do. All of these programs operate through DOS (including DOS 6.0). They take most of your disk and convert it to a single file that holds all the compressed data. A software driver makes the file look like another disk to your PC programs. We saw little variation in compression speed during initial setup—each program compressed our 350MB drive in just over an hour—although DoubleSpace came in a few minutes ahead of the rest.

Conventional disk utilities don't take well to compression programs. They are not familiar with the weird disk structure that compression programs use and cannot properly defragment files. Consequently, all three compression alternatives come with all necessary utilities, including one for defragmentation.

The biggest problem we encountered in building gigabyte-level disks with compression is the mystification surrounding the software. Many essential details are undocumented. For example, neither SuperStor nor DOS 6.0 warns you of capacity limits. Neither program can stretch a half-gigabyte drive to a full gigabyte, unless you break your hard disk into multiple partitions and compress each separately. SuperStor Pro warns only that the disk is too large during setup and refuses to do anything without ever telling you its limit. DOS 6.0 dutifully builds the biggest compressed volume it can but doesn't tell you why. Only Stacker 3.0 converted a 512MB disk into a full 1GB of simulated storage space.

Our primary reason for selecting DoubleSpace is its integration with DOS 6.0, which makes it the most invisible of compression programs. Boot with another version of DOS, of course, and your compressed files will be invisible, but otherwise you won't be bothered with the minutiae of compression management.

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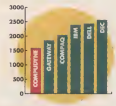
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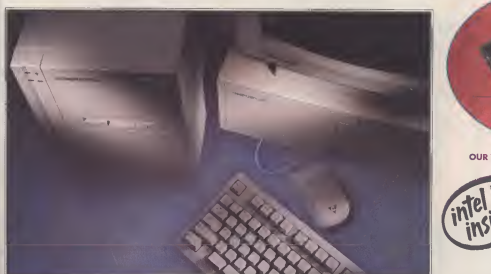
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Charles McGuire, fraud production consultant in Boise, uses ScanMan 256 with OCR to put text and images into a professional-looking newsletter on fish farming. Now he's reeling in clients.



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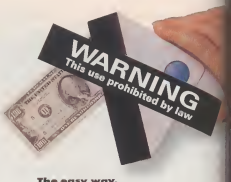
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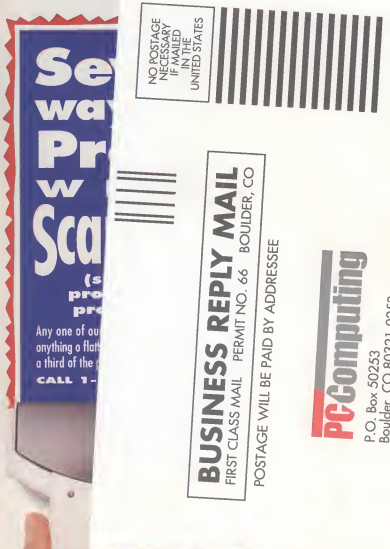
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together individual scans. It makes his data more moving.

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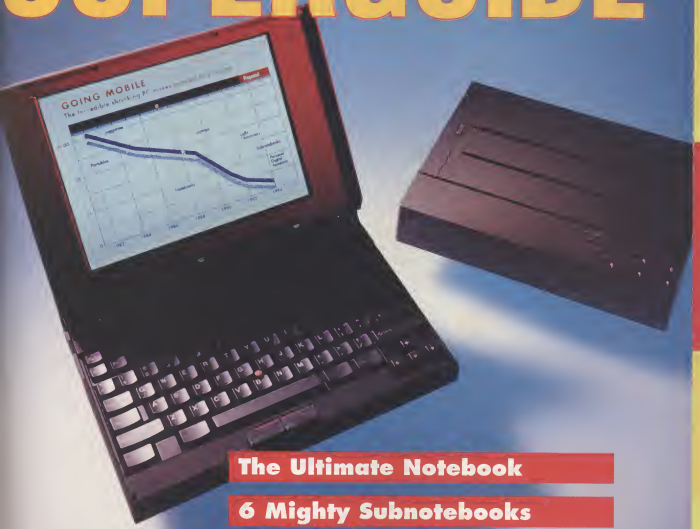
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LOGITECH

The Senseware™ Company

PC Computing

MOBILE COMPUTING SUPERGUIDE



The Ultimate Notebook

6 Mighty Subnotebooks

11 Speedy Pocket Modems

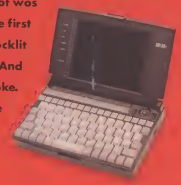
12 Tiny Mobile Printers

60 Powerful PCMCIA Cards

THE ZEOS® CONTENDA



The "fasten seatbelt" sign just went off. Already you're cranking away on that spreadsheet. Gotta love it: A machine *this* size does Windows! • Tonight: Albuquerque. Tomorrow: Back to the coast. Nothing like doing Windows all over the world. You glance at your briefcase, jammed with file folders and a few magazines. That review in *PC/Computing* this month said the Contenda "makes taking Windows on the road a no-brainer." What was really a no-brainer, you think, was the decision to buy one in the first place. • It's starting to rain. Good thing this Contenda has a backlit display. It makes working in even dim cabin lighting a pleasure. And the keyboard: it's so close to full size, touch-typing is a piece of cake. Not to mention the built-in trackball. Sure is nice not having to take along a mouse these days. • Now, where were you? Ah, yes. The spreadsheet. Now if you could just remember whether you packed that file folder with all the sales figures...



THE ZEOS FREESTYLE



There you are. Poolside. The light is so bright you're squinting behind your Ray-Bans. Thanks to the speed of your new Freestyle Notebook, you finished your sales report hours ago. So now you can work on what's really important: Your Novel. The one with the plot so exciting it's going to catapult you instantly into fame, fortune, and the talk show circuit. • You adjust the screen to the perfect viewing angle, take a long sip from your drink. You detect a few envious glances your way. Yes, your Freestyle sure is sleek. No one's ever seen a tilt and swivel display like this before. And when you made that presentation last night where you plugged in a color monitor for simultaneous display, you could tell that even that old stone-faced Senior VP was impressed. As if you didn't notice. • Back to Your Novel. Where to begin? The keyboard is so comfortable, your fingers just fly. "*It was a dark and stormy night...*"



THE ZEOS CONTENDA

Choose from three money-saving packages for each CPU. Or, we can custom-build a system to your exact specifications. Just give us a call!

	386SL			486SL		
	#1	#2	#3	#1	#2	#3
	$1495	$1795	$1995	$1795	$1995	$2395
Intel 386SL CPU	■	■	■			
Intel 486SL CPU				■	■	■
25MHz Processor Speed	■	■	■	■	■	■
Intel's PI local bus for video acceleration				■	■	■
Memory	2MB	4MB	4MB	4MB	4MB	8MB
80MB hard drive	■	■	■	■	■	■
Uses 3.3v technology				■	■	■
VGA backlit display; 640x480, .23mm dot pitch, up to 64 shades of gray	■	■	■	■	■	■
Video RAM	256K	256K	256K	512K	512K	512K
Simultaneous video with external color monitor	■	■	■	■	■	■
NiMH battery; power up to 4 hours	■	■	■	■	■	■
Fully-featured power management	■	■	■	■	■	■
Flash ROM for easy BIOS upgrades	■	■	■	■	■	■
80-key keyboard	■	■	■	■	■	■
Embedded numeric keypad	■	■	■	■	■	■
Easy-to-use built-in trackball	■	■	■	■	■	■
One serial & one parallel port	■	■	■	■	■	■
Ports for optional internal modem, external floppy, SVGA color monitor	■	■	■	■	■	■
External 3.5" floppy drive		■	■		■	■
DOS 6.0 with Enhanced Tools		■	■		■	■
Windows 3.1		■	■		■	■
Lotus Organizer		■	■		■	■
Carrying case			■			■
Extra battery			■			■
Internal 9600/2400 baud send/receive fax modem			■			■
24-Hour Toll-Free Technical Support	■	■	■	■	■	■
30-Day Money-Back Guarantee	■	■	■	■	■	■
One Year Limited Warranty	■	■	■	■	■	■
Complete Customer Satisfaction Package	■	■	■	■	■	■
FCC Class B approved	■	■	■	■	■	■
UL Listed	■	■	■	■	■	■

Pack Son
Subnotebook
386 or 4

THE ZEOS CONTENDA. LESS THAN FOUR POUNDS—YET RUNS WINDOWS!



"...if you're looking for a subnotebook and want to make next to no compromises, then the $1495 ZEOS Contenda is your best bet."
***—PC Week*, February 1, 1993**

"Introduced only months after Gateway 2000's popular Handbook, the Contenda is a generation ahead."
***—PC/Computing*, May 1993**

PC Week calls the ZEOS Contenda "the best yet of the new crop of lightweight, full-featured machines." We weren't satisfied with "best yet"—so we've made it even better. Because now you get your choice of 386SL or 486SL CPU!

FEATURES THAT PULL NO PUNCHES.

It's impossible to find a notebook on the market today that's this light, this small, this affordable—and still gives you *so much power.*

But with the ZEOS Contenda, it's all here.

We start with a smart Intel SL processor. The Contenda's CPU extends your battery life significantly—because it's intelligent enough to power-down the memory, disks, modem and more when they're not in use.

What's more, the Contenda's features make it a pleasure to use. Features such as a VGA backlit screen that's crisp and vibrant. A built-in trackball so you won't have to tote a mouse around. Enough power and memory to easily run Windows. And at less than four pounds in weight, it's probably lighter than your briefcase!

386SL OR 486SL: PLENTY OF POWER & ROOM FOR WINDOWS!

The 486SL Contenda gives you everything the 386SL version does, plus a few choice enhancements: 3.3 volt technology for added battery life, extra video RAM, and PI local bus video for Windows acceleration.

Take your pick! You'll find all the Contenda packages give you the power and room for practically everything you'd use in a desktop system. You can easily run DOS, Windows, and Windows applications. *And you can get all three in an affordable package*—including the new Lotus Organizer—the personal information manager that's so easy to use, it could make your Day Timer obsolete. Check out the packages on the left for details. Then give us a call: 800-554-5218!

ne Power!
or Notebook
86 CPU!



THE ZEOS FREESTYLE. THE ULTIMATE IN PORTABLE POWER.

To try and compare the ZEOS Freestyle to any other notebook is next to impossible. Because nothing else has all its features. And even with all these great features, nobody can match its incredible price. And now, with your choice of 386SL or 486SL CPU, it would seem the ZEOS Freestyle is the best of all worlds. It is!

THE BEST DISPLAY. GREAT VIDEO TOO.

Not only is the ZEOS Freestyle Notebook's screen big and easy to read, but the video is high-contrast and fast. Plus, there's the incredible tilt and swivel display—an industry first. You can swivel the screen left and right as well as tilt it up and down for the perfect viewing angle!

For video control, we chose an amazing new 3.3 volt VGA controller. It not only consumes less power, it also produces the fast, crisp images you're looking for. And with a business machine like this you'll also appreciate our dual display capabilities. You can connect an external VGA color monitor for simultaneous display! And that's not all.

POWERFUL. AND INCREDIBLY PORTABLE.

Both Freestyle options include the smart and powerful Intel 25MHz SL CPU, memory up to 20MB and hard drive up to 180MB. The 486SL version also gives you a built-in math coprocessor and more advanced power management. Either one might well replace a desktop for many users. Plus, at only 5.6 lbs. with a built-in soft carrying handle, your ZEOS Freestyle is one of the most *portable* notebooks around!

GREAT NOTEBOOKS. GREAT CUSTOMER SUPPORT.

Our relationship with you doesn't end once we ship your new Notebook. You can call us with your questions *24 hours a day, 365 days a year, and always toll-free.*

What's more, if you're not convinced your new ZEOS Notebook is everything we say it is and more, you have a full 30 days to return it to us for a complete refund—no questions asked. Plus, you're covered by our One Year Limited Warranty and much more. You're going to be very satisfied. We guarantee it!

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THE ZEOS FREESTYLE

Choose from three money-saving packages for each CPU. Or, we can custom-build a system to your exact specifications. Just give us a call!

	386SL			486SL		
	#1	#2	#3	#1	#2	#3
	$1295	$1795	$2295	$1695	$1995	$2495
Intel 386SL CPU	■	■	■			
Intel 486SL CPU				■	■	■
25MHz Processor Speed	■	■	■	■	■	■
Memory (expandable to 20MB)	2MB	6MB	10MB	4MB	4MB	8MB
Hard drive (MB) (expandable to 180MB)	60MB	120MB	180MB	60MB	120MB	180MB
Uses 3.3v technology				■	■	■
3.5" 1.44MB floppy drive	■	■	■	■	■	■
VGA 10" backlit display; tilt/swivel base. 640x480, up to 64 shades of gray	■	■	■	■	■	■
Video RAM	256K	256K	256K	512K	512K	512K
Simultaneous video with external color monitor	■	■	■	■	■	■
NiCad battery; power up to 3 hours	■	■	■	■	■	■
Full power-saving features including built-in Suspend/ Resume	■	■	■	■	■	■
81-key keyboard	■	■	■	■	■	■
Full-size inverted "T" arrow keys	■	■	■	■	■	■
Embedded numeric keypad	■	■	■	■	■	■
Easy-to-use built-in mouse key	■	■	■	■	■	■
Serial, parallel and SVGA ports; port for external keyboard or numeric keypad	■	■	■	■	■	■
Flash ROM for easy BIOS upgrades	■	■	■	■	■	■
DOS 6.0 with Enhanced Tools	■	■	■	■	■	■
Windows 3.1		■	■		■	■
Carrying case		■	■		■	■
Extra battery			■			■
External charging stand			■			■
Internal 9600/2400 baud send/receive fax modem			■			■
24-Hour Toll-Free Technical Support	■	■	■	■	■	■
30-Day Money-Back Guarantee	■	■	■	■	■	■
One Year Limited Warranty	■	■	■	■	■	■
Complete Customer Satisfaction Package	■	■	■	■	■	■
FCC Class B approved	■	■	■	■	■	■

Circle 248 on reader service card.





Choose Your Weapon





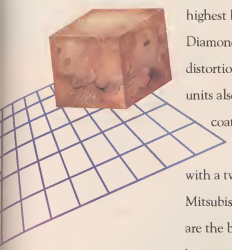


Mitsubishi Flat Square Monitors Give Your World A New Perspective.



Long-Term Durability
Competitively Priced
Two-Year Warranty
Low Emission Design

Explore a brilliant new world of increased display clarity with Mitsubishi's third generation of flat square color monitors, including the Diamond Scan 15FS, Diamond Scan 17FS and Diamond Pro® 21FS. The Mitsubishi 15", 17" and 21" flat square line reduces image distortion and screen glare while delivering high-end performance, quality and features —all at exceptionally competitive pricing. ♦ Each of the models features an ultra-fine 0.28 mm dot pitch suitable for all high resolution applications; an Invar mask for sustained high brightness levels; an ergonomically-designed, compact enclosure with a tilt-swivel base; and easy-to-operate, microprocessor-based user controls on the front panel. To provide the highest levels of display accuracy, the Diamond Scan 17FS and top-of-the-line Diamond Pro 21FS incorporate Dynamic Beam Forming, which reduces image distortion found at the edges of any monitor not equipped with this feature. ♦ Both units also feature Mitsubishi's exclusive new optical quality anti-static and anti-glare coating on a high contrast tinted CRT. What's more, all three monitors meet strict international guidelines for low magnetic emissions and are fully backed with a two-year warranty on parts and labor. ♦ You also have confidence in knowing Mitsubishi's service and support programs are the best in the business. See our latest *— and greatest —* generation of flat square monitors for yourself. And gain a new perspective on quality, durability and value. ♦ For more information, call us at 1-800-843-2515. In Canada, call 1-800-387-9630 or in Mexico 91-800-83456.





MSRP: DS15FS $645

MSRP: DS17FS $1,299

MSRP: DP21FS $2,999

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Circle 175 on reader service card.

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Desktop Power *On the* ROAD

Who needs an office? New mobile computing products provide desktop muscle in a rugged lightweight package.

BY MARTY JEROME

You *can* take it with you. These days, in fact, you *have* to take it with you. All of it—data, dazzling graphics, communications capability, and sheer computational horsepower. Work doesn't stop just because you're out of the office. Numbers still need crunching, presentations need punching up, monthly reports need analysis. And you need to stay in touch.

Thankfully, technology is keeping up with demand for mobility. If you're willing to pay the price, you can replace every piece of your high-performance desktop with a portable alternative. The ultimate PC is now small and light enough to fit in a carry-on bag or on a desktop.

Thanks to the accelerated pace of technological change, there's never been a better time to look at portable PCs and peripherals. Some advances, like wireless communications and handheld personal digital assistants, are still long on promise and short on delivery. But in other key areas mobile computing has reached its potential, with fast CPUs, brilliant color, ample storage, and high-speed communications—all packed into a small, capable, highly integrated package that's at home just about anywhere.

READY FOR TAKEOFF Just look at mobile systems themselves. Sales of notebook PCs soared 254 percent between 1990 and 1993, thanks to two key factors: power management and price. Acceptance of Advanced Power Management, the battery-saving specification developed by Intel and Microsoft (among others), helped usher in a generation of notebooks based on power-hungry 486 CPUs.

Today, the 386 notebook is all but dead. Compudyne's 4-pound 486-based subnotebook points the way for even smaller platforms. With the downward price slide of the 486 CPU, there's simply no reason to settle for less.

Improved power management also allows notebooks to run active-matrix color displays without a huge penalty in battery life. Meanwhile, prices for active-matrix technology, which floated in the $7,000 to $10,000 stratosphere even 15 months ago, have spiraled down. IBM lowered the boom last autumn with its 486SLC-based ThinkPad 700C, which featured a 10.4-inch active-matrix color display and cost well under $5,000. It was nothing short of revolutionary.

Fact is, you no longer have to justify buying active-matrix color by arguing that you create high-powered presentations or use a notebook as your sole PC. Windows is reason enough. After all, if you've got to stare at a tiny display for hours on end, it should offer sparkling clarity and rich saturation of hues. Color lets you pack more information on your screen. You can discern trends more quickly and communicate ideas more effectively. Despite highly improved passive-matrix displays in notebooks from Toshiba and Dell, among others, it is a fading technology. If you're going to get color, make it active. Executive Editor Ron White sizes up ten 486-

PHOTOGRAPHS BY STAN MUSEK





The Ultimate Notebook See page 184

11 Speedy Pocket Modems See page 212

12 Tiny Mobile Printers See page 228

60 Powerful PCMCIA Cards See page 238





class active-matrix color notebooks in search of the finest money can buy. All come in well under $5,000.

Of course, not everyone needs full desktop computing capability on the road. For fetching e-mail, tweaking a spreadsheet budget, or drafting a simple memo, subnotebook PCs have finally evolved into serious business tools. At four pounds or less for a Windows-capable PC with a backlit display and a keyboard you can touch-type on, you won't think twice about carrying one in your briefcase, even for short hops. White searches for the best product in what is today's most exciting collection of systems designs.

Other mobile systems have begun to mature as well, including pen computers, which, as offerings from NEC, AST, and Grid demonstrate, work best when they supplement traditional notebook computers rather than replace them outright. Pen applications continue to trickle to market, but until OS standards settle, they buy you into a fickle future. The same is true of the emerging class of PDAs. Though an estimated 600,000 hand-held devices were sold last year, their strength is proprietary communications, not productivity. We expect them to evolve fast enough to make our next Mobile Computing Superguide.

TALK FAST Not that communications is a trivial matter—it's the key application most business travelers need. What's more, we want to move information as fast as data-compression and error-correction standards allow. Sales of high-speed modems will quadruple by 1998, according to the research group Market Intelligence. Leading the pack will be pocket-size modems and fax modems, a category virtually unheard of three years ago. Their small size means the ultimate in portability, especially between notebook and desktop PCs.

Contributor Joe Salemi looks at 11 V.32bis pocket modems and fax modems. Why pay the premium for a 14,400 bit-per-second modem when standards for 9,600-bps transmission have just recently settled? Because you'll recover your investment in reduced phone bills and connect charges in no time flat. Keep in mind that your own time has a dollar value as well, especially when you're on the road. Besides, you'll kick yourself one year from now when the rest of the world communicates at 14,400 bps. The V.32bis standard—long in coming—offers the fastest, most reliable data transmission you'll find.

Another traveling technology that's made significant advances is portable printing. Traditionally, output from portable printers has tended to have a seasick quality. But as *PC/Computing* reviewer Peggy Wallace discovered, today's business travelers can get 300-dot-per-inch PostScript documents from a battery-powered, 4-pound box. Close a deal, then print the contract on the spot. Who needs an office?

Finally, we take a look at the newest frontier in portable computing technology. PCMCIA is real, it's here, and it's going to change the way you work from the road in fundamental ways. Sure, it's not perfect. Socket Services are still troublesome. Incomplete implementations of the specification have hindered its acceptance. And a dearth of peripherals has kept user enthusiasm tepid at best.

But as communications expert Earle J. Robinson demonstrates, the drought is over. Scores of PCMCIA peripherals, including LAN adapters, fax modems, hard drives, and memory cards, are available today. A year from now you won't even consider buying a notebook without at least one PCMCIA slot, preferably two. Nor should you today. They offer unparalleled convenience and upgradability.

In fact, the technologies showcased here are the best of their breed, partly because they conform to time-tested industry standards. More important, all have a foot in the future, either through upgradability or expandability. This ensures that they can evolve along with your traveling needs, and that they can do so within your budget.

MOBILE COMPUTING SUPERGUIDE

184 THE ULTIMATE NOTEBOOK For full desktop power on the road, you should settle for nothing less than an active-matrix color 486. But when weight is the number-one consideration, slip a 4-pound, Windows-compatible subnotebook in your briefcase instead. We put 10 notebooks and 6 subnotebooks through their paces.

212 HIGH-SPEED POCKET MODEMS No-compromise communications in a package small enough to slip in your shirt pocket. We find the lowest price, the best performer, and the best all-around value among 11 14,400-bps fax modems. Plus a quick look at the best file-synching software around.

228 PORTABLE PRINTERS PostScript-quality output in a battery-powered, 4-pound box. Our tests of portable printers uncover three great ways to produce hard copy in a hotel room—or anywhere your travels take you.

238 PCMCIA ARRIVES The latest trend in portable technology, PCMCIA promises to do for notebooks what ISA expansion slots did for the PC. We look at modems, storage devices, and network adapters, and explain clearly what each PCMCIA type does.

CONTROLLING YOUR DESKTOP PC FROM A PORTABLE USED TO REQUIRE A LITTLE TRAINING.

You're not some sort of genius or anything, are you? No? Good, you've come to the right ad.

Because finally, an area that used to be the private domain of only the most technical-minded among us – remote computing – is now readily available to the masses as well, thanks to the all-new Norton pcANYWHERE™ 1.0 for Windows.™

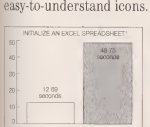
WINDOWS APPLICATION

Call Host PC

Point. Click. Voila. you're a remote computing expert

What's remote computing? Quite simply, it means taking control of your desktop PC from a portable (or another PC). And pcANYWHERE makes this easier than ever.

That's because it's designed especially for Windows, so it has a highly intuitive interface based on easy-to-understand icons. (In plain English, that means learning how to use this new software is no more difficult than following the average sitcom plot.) Sure, you get an instruction manual. But we think you'll be surprised how little you have to refer to it.



Think fast. Ours is the quickest remote Windows software you can buy.



Okay, now say you're away from the office, but still need to get some work finished. No problem. If you have a copy of pcANYWHERE and a modem, all you do is connect your portable to a phone line, then dial up your "host" PC back at the office. You'll transfer files with point-and-click ease, move data around, print out your documents – even tap into the "home" network – as easily as if you were sitting in front of your own desktop computer. What's more, you'll be able to simultaneously perform other tasks on your portable, while still remaining connected to your remote session.



A new idea from Peter Norton, the leader in utilities software.

To learn more about the product that can increase the size of your office by a few million square miles, dial FAST FAX 1-800-554-4403. Better yet, go ahead and pick up pcANYWHERE today at your nearest retailer. It costs about $199.™

Which makes it considerably cheaper than a graduate degree in computer science.

THE NORTON pcANYWHERE FOR WINDOWS

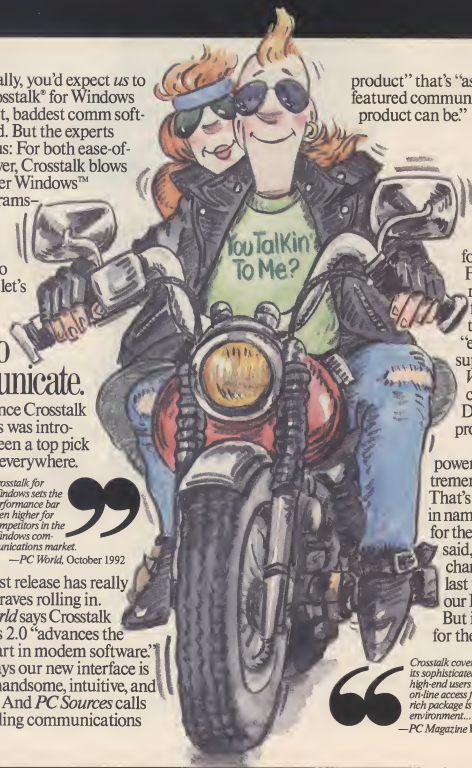
SYMANTEC.

Circle 141 on reader service card.

Tested on 486 PC, 4MB RAM. ™Option 1, document 455. ™Suggested retail price. Actual price may vary. Valid in the U.S. and Canada only. For more information in Europe, call 31 71-353111. In Australia, call 612-879-6577. In Canada, call 1-800-465-2266. Everywhere else outside U.S., call 408-253-9570. Windows is a trademark of Microsoft Corporation. Other names are trademarks of their respective holders. ©1993 Symantec Corporation.

The Leader Of The Pack In Windows Comm Software.

Naturally, you'd expect *us* to say that Crosstalk® for Windows is the biggest, baddest comm software around. But the experts agree with us: For both ease-of-use and power, Crosstalk blows past the other Windows™ comm programs—including Procomm Plus® for Windows. So hop on, and let's hit the road.



Born To Communicate.

Ever since Crosstalk for Windows was introduced, it's been a top pick of reviewers everywhere.

> *Crosstalk for Windows sets the performance bar even higher for competitors in the Windows communications market.*
> —*PC World*, October 1992

But its newest release has really brought the raves rolling in.

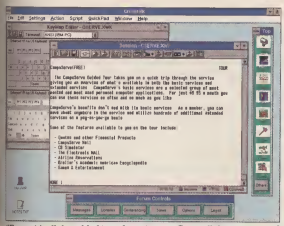
PC World says Crosstalk for Windows 2.0 "advances the state of the art in modem software." *PC Today* says our new interface is "extremely handsome, intuitive, and easy to use." And *PC Sources* calls it "a compelling communications product" that's "as easy to use as a full-featured communications software product can be."

Easy-To-Use Rider.

Crosstalk has always been known for its horsepower: Features like the terminal emulations and file transfer protocols that *InfoWorld* rated "excellent." And the superior speed that *Windows Sources* called "as fast as any DOS communications program."

But now all that power is combined with tremendous ease of use. That's why *PC Magazine*, in naming us Editors' Choice for the second year in a row, said, "This package has changed a great deal since last year, when it earned our Editors' Choice Award. But it has changed only for the better."

> *Crosstalk covers all bases with its sophisticated scripting for high-end users and quick on-line access for novices. This rich package is suitable for any environment...*
> —*PC Magazine* Editors' Choice, April 1993



"Even with all the added interface pizzazz, Crosstalk keeps an air of clean, no-nonsense functionality, unlike Procomm for Windows, which offers enough glitz to be distracting."
—*PC World*, October 1992

Crosstalk Leaves The Competition In The Dust.

Fact is, if you're ready for a Windows comm program, there are two products you're most likely to consider: Crosstalk for Windows and Procomm Plus for Windows. And reviewers have been clear about their preference.

PC Magazine called our interface "elegantly designed" while noting that with Procomm Plus for Windows, "so many non-essential elements remain on-screen during terminal sessions." And *Windows Sources* commented that Crosstalk, "unlike Procomm for Windows, provides a full screen for sessions."

And when you have questions, here's what you'll find, according to *InfoWorld*: "DCA's technical support staff was very professional." They answered "with little or no delay and knew the program thoroughly." On the other hand, they "tried to reach Datastorm technical support more than 30 times in two weeks. All we ever got was a busy signal."

InfoWorld summed it all up: "Crosstalk is stronger than Procomm for Windows." 'Nuff said.

A Few Key Differences Between Them And Us	Crosstalk for Windows	Procomm Plus for Windows
Ease-of-Use Features		
Automatic Font Sizing	YES	no
Multiple Sessions	YES	no
Multiple Document Interface (MDI) Support	YES	no
Built-in Text Editor	YES	no
Built-in Script Editor	YES	no
Drag-and-Drop File Transfer	YES	no
Drag-and-Drop Keyboard Remapping	YES	no
Ready-to-Use Scripts for AT&T® Mail, CompuServe,® Delphi,® Newsnet, Lexis/Nexis, OAG, VU/TEXT (Dialog)	YES	no
Power Features		
HP 700/94 and 2392A Emulations	YES	no
INDSFILE File Transfer Protocol	YES	no
Built-in NASI/NCSI LAN Support	YES	no

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In *Search* of the Ultimate NOTEBOOK

We began with 16 notebooks and subnotebooks. We ended with two top-notch portables that will put your desktop PC to shame.

BY RON WHITE

You know the advantages—the *unfair* business advantages—you gain from a PC that plows through problems like a laser cuts through paper. You don't want to leave that power behind just because you're on a 12-city, 6-day tour of the Midwest. And we don't blame you.

That's why we set out to find not just a good portable computer, but the ultimate notebook PC for the business road warrior. We wanted it to pack all the power and features of your gorilla desktop system in a package that fits on an airline tray table. We demanded a color display, for example. In Windows, color equals information—it enables you to quickly discern an icon, make sense of a chart, or deliver bright, compelling presentations. For really great color, you're talking active matrix. Passive-matrix color displays are . . . well, passive—wimpy, washed out. And the bigger the display, the better.

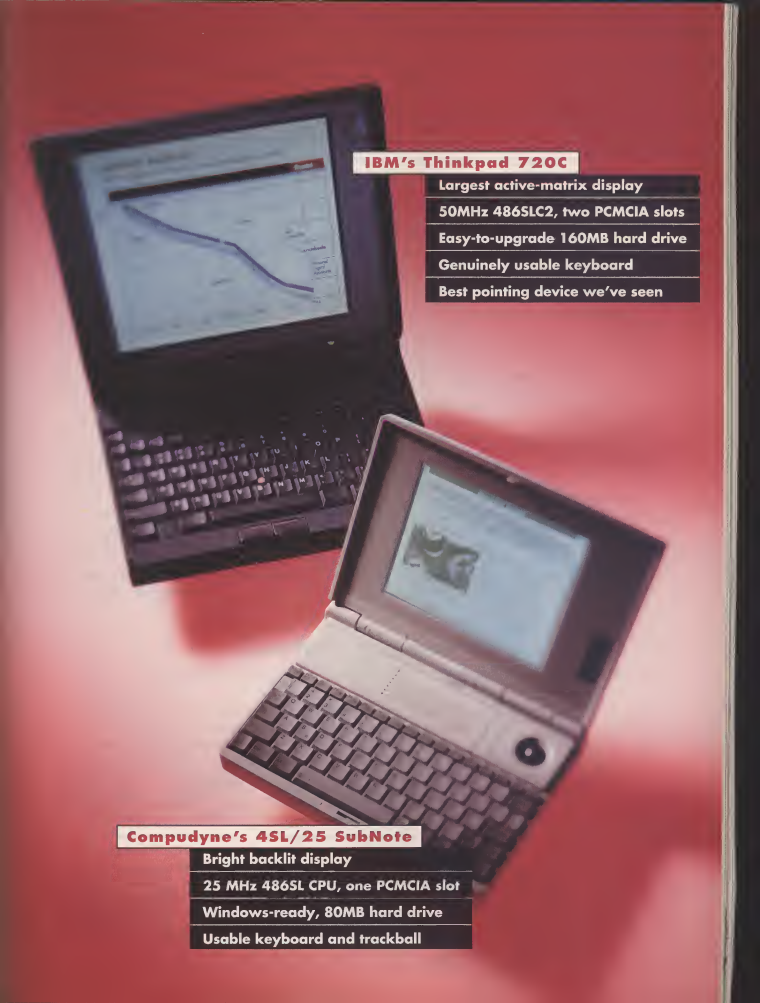
Speed's another requisite. When working with graphics—spreadsheet charts, presentation slides, documents with graphic objects—slow CPUs drag you down. We considered nothing less than 486-based notebooks.

Likewise, we searched for outstanding keyboards and pointing devices. Nothing is more likely to cramp personal productivity than a kludgy keyboard. Your fingers have a memory of their own, and among their fond recollections are the generously sized and thoughtfully placed Backspace, Caps Lock, Home, and Shift keys of your expansive desktop keyboard. Use a portable keyboard with anything less, and your fingers wind up stumbling over themselves like drunken centipedes.

The ultimate notebook has a big hard drive, of course—120MB at a minimum. And did we mention that it should be fast? While we're at it, let's be greedy. Lots of RAM. PCMCIA slots. Built-in 14,400-bit-per-second modems. All those features—plus little extras like battery gauges and swappable hard drives—will help you make it through the night at a Holiday Inn with as little anguish as possible.

Yes, we're talking about a lot of equipment here, and until the laws of the conservation of mass and energy get repealed, more equipment will continue to mean more weight and size. But some notebooks are better than others at packing a lot of goodies into a little package. (And if portability is more important to you than color and pure power, check out our review of the best of the subnotebooks on page 198.)

So we began the search by ordering every 486-based, active-matrix color notebook that was shipping at press time. We wound up with ten systems: AST's PowerExec 4/25SL ColorPlus, Compaq's Contura 4/25CX, Compaq's LTE Lite 4/25C, IBM's ThinkPad 720C, NEC's UltraLite Versa 25C, PC Brand's LeaderBook Pro, Toshiba's T4500C, and Zenith's Z-Note 425 Lnc Model 200, and two virtually identical notebooks, Twinhead's Slimnote

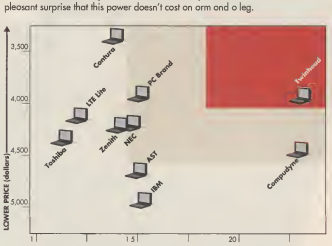

IBM's Thinkpad 720C
Largest active-matrix display
50MHz 486SLC2, two PCMCIA slots
Easy-to-upgrade 160MB hard drive
Genuinely usable keyboard
Best pointing device we've seen
Compudyne's 4SL/25 SubNote
Bright backlit display
25 MHz 486SL CPU, one PCMCIA slot
Windows-ready, 80MB hard drive
Usable keyboard and trackball

4DX2/66T and the 486DX2/66 Color Slimnote, which is made for Compudyne by Twinhead. We ran the notebooks through a suite of Windows-based tests to gauge performance and battery life. We measured and weighed them and spent hours working at their keyboards and displays. We wound up with a few surprising results but some sure bets for the ultimate in mobile computing.

BEST PERFORMER FOR THE MONEY

Horsepower alone doesn't have to cost more.

It's no surprise that Twinhead and Compudyne finished tops in ZD Labs' tests—both are driven by clock-doubled 66 MHz processors—but it's a pleasant surprise that this power doesn't cost an arm and a leg.



DISPLAY What most obviously sets these notebooks apart from run-of-the-mill portables are their displays. Active-matrix color is beautiful to behold. There's no glare. The color is uniformly brilliant and sharp even if you're viewing the screen from an angle. The refresh rates are fast enough that the Windows pointer doesn't disappear each time it moves. The downside to active-matrix displays is cost: they command about $1,500 more than monochrome displays and about $750 more than their washed-out passive-matrix cousins. They also make heavier demands on the batteries and add a half-pound or so to the machine's overall heft. After one glimpse of an active-matrix color screen, however, we guarantee that you'll never be happy with anything less.

The displays of the ten notebooks we looked at differed little except in size. The IBM ThinkPad 720C has the biggest—it's 10.4 inches diagonally, which is 2 inches larger than the smallest of the lot. The IBM's display is also brighter than the others.

Taking another tack, PC Brand's LeaderBook features a virtual screen that, in Windows, adds display real estate beyond its 8.48-inch diagonal measure. If you move the pointer past the right edge of the screen, the display pans over to reveal another 1.75 inches of viewing area, and about 1.25 inches lurk at the bottom of the screen. The effect is handy for viewing objects crammed into a corner of the screen; the same feature comes with the drivers for some video boards.

Still more innovative is the display on the NEC UltraLite Versa, which begins as a spacious 9.4-inch but otherwise ordinary active-matrix color screen. But push a couple of snaps, pop off the screen, turn it around, then

THE ROAD TO THE ULTIMATE NOTEBOOK

An up-close and personal look at the best (and worst) features of 16 notebooks.

We've come to expect a lot from Compaq—but not this. Both the **Compaq Contura 4/25CX** and the **LTE Lite 4/25C** finished near the bottam in performance tests. Add to thot their keyboards: ane cantinuaus, canfusing expanse af keys. On the bright side, bath notebooks feature **trackballs** an their screen panels, perfectly positianed for camfart—unless you're a sauthpaw.





Compaq LTE Lite

Mare disappointing results from unexpected saurces: The **Toshiba T4500C** jained the Campaqs at the back af the pack in perfarmonce. The Micrasaft BallPaint Mause an the Tashiba is cumbersame. But at least the Tashiba's "hot part" eliminates the cable hanging aff mast pointers, and the **T4500C** wos second only to the Compaq in light weight. Better yet, the **T4600C** [see the review in Newl, page 61) replaces the **T4500's** lackadaisicol 20MHz 486SL pracessar with a 33MHz versian and adds an additianal PCMCIA slot to make it a real cantender in this competitive field.

Like the Tashibo, **Zenith's Z-Note 425Lnc Model 200** comes equipped with handy **LCD power gauges**. Its Logitech TrackMon is just as hard to use as the Tashibo's BallPaint, but the Z-Nate cames with a built-in **Ethernet port**. Shrewd idea.





pop it back on. Voilá—instant pen computer. It's a little heavy for a pentop, perhaps, but it beats the pants off the Grid Convertible.

PERFORMANCE We tested our roundup of notebooks with two sets of Windows-based benchmarks. The ZD Bench tests the performance of various individual components, such as the processor and hard drive. It showcases a system's general performance bottlenecks—and its advantages. WinTest checks overall performance in real-world applications by timing elaborate macros in Microsoft Word for Windows and Microsoft Excel. It's a good barometer of the performance you can expect using common Windows applications.

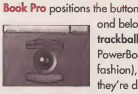
In both test suites, the pair from Twinhead and Compudyne finished at the top of the heap, with the Twinhead leading by a nose. No surprises here. Both are driven by clock-doubled 66MHz processors—the fastest of the lot. This is blazing power even by desktop standards. In a notebook, it's downright astounding.

Some results weren't what we expected, however. In processing chores, the IBM ThinkPad 720C—the only notebook with a chip-doubled 50MHz processor—actually performed slightly slower than the 33MHz 486DX-based PC Brand LeaderBook Pro. The ThinkPad uses IBM's own 486SLC2 processor, which gets its 50MHz speed by doubling the timer, so the processor works at the faster speed only internally, while dealing with outside components at 25MHz. And the 16-bit SLC2 doesn't have the built-in math coprocessor or the 32-bit data path of a DX chip.

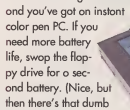
Several lessons can be gleaned from our tests. Lesson 1: If you use applications that draw heavily on processor power, like presentation graphics or financial modeling, get a DX chip rather than a chip-doubled processor. Lesson 2: Ignore Lesson 1. Although the 33MHz 486DX outperformed a clock-doubled 50MHz SL processor, it did so only in processor chores. The ThinkPad's overall performance in both the ZD Bench and WinTest suites lagged only behind that of the DX2/66s, thanks to the memory, disk, motherboard design, and other components working with the CPU. For example, the ThinkPad is the only notebook tested to have a 16K external RAM cache, which boosts the speed at which the CPU communicates with memory. On the other hand, the fast-processor LeaderBook Pro is dragged down by other components—particularly its hard drive—so that overall, its performance dragged in real-world application tests.

Our tests also confirmed that you can't necessarily rely on hot technologies to ensure top performance—especially when those technologies are proprietary. The NEC UltraLite Versa, for example, comes with local-bus video. But the proprietary design, using a standard Windows VGA driver, won the UltraLite Versa only third place in our video test. When we tested the notebook with NEC's special local-bus drivers, it scored even worse. While this result may seem surprising, it supports the similar disappointing scores our testing has found on NEC's local-bus desktop PCs.

Meanwhile, don't underestimate traditional technologies for boosting speed. Zenith's Z-Note trailed only the 66MHz notebooks in DOS performance, and it beat the ThinkPad in our Excel test. The explanation? Zenith's hard drive is by far the fastest of any of those we tested, so it's going to shine when running disk-intensive apps such as databases. Likewise, the AST PowerExec

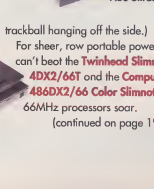


What o difference o pointer's button placement makes. **PC Brand's LeaderBook Pro** positions the buttons above and below the **trackball** (in PowerBook-like fashion), where they're difficult to hit. The **AST PowerExec 4/25SL ColorPlus** also puts the **trackball** below the space bor, but rotates the buttons 90 degrees for o winning arrangement.



The **PowerExec** is an all-around performer with o **removable hard disk** that makes for easy upgrades.

The **NEC UltraLite Versa 25C** is the most innovative of the notebooks we tested. **Remove and flip its screen** so that it lies flat against the keyboard, and you've got an instant color pen PC. If you need more battery life, swap the floppy drive for o second battery. (Nice, but then there's that dumb

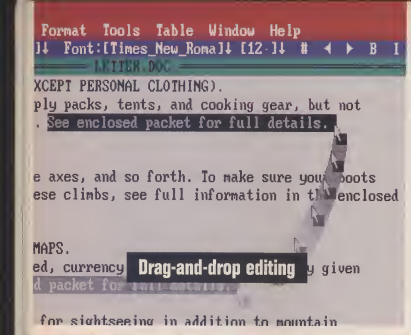


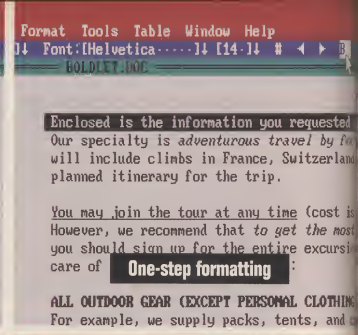
NEC UltraLite Versa 25C

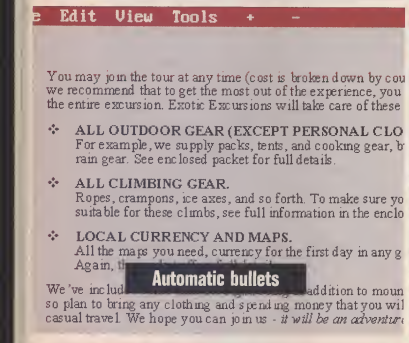
trackball hanging off the side.)

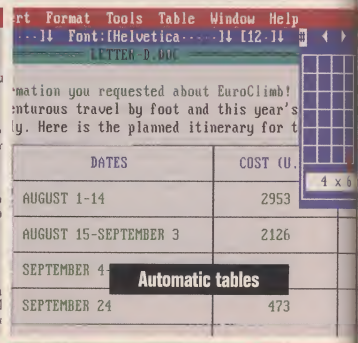
For sheer, row portable power, you can't beat the **Twinhead Slimnote 4DX2/66T** and the **Compudyne 486DX2/66 Color Slimnote.** Their 66MHz processors soar.

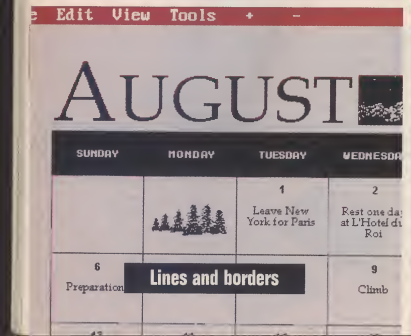
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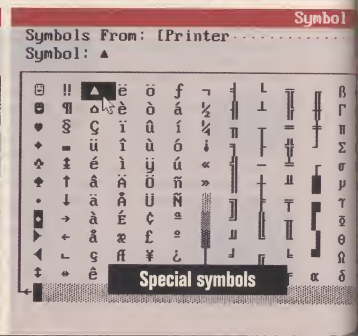

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screamed through our video tests, turning scores in the range of the ThinkPad's and the Z-Note's, thanks to a speedy video chip set. And while performance on both the Toshiba T4500 and the Compaq LTE Lite was disappointing, Toshiba, at least, has introduced the T4600, which among other new features swaps the 20MHz 486SX processor in the T4500 with a full-bore 33MHz 486SL. (For a complete review of the T4600, see "Toshiba's Notebook Twins" on page 61.)

USABILITY The fastest notebook and the most brilliant screen offer little advantage if a poorly designed keyboard and pointing device prevent you from working at full throttle. Keyboards have always been a sore point with portable PCs, but better notebooks prove that you don't have to sacrifice on this score. Most of the notebooks we tested fit all 12 function keys on the keyboard without resorting to a special shift-*function key* combination to access F11 and F12, and some notebooks shoehorned them in place better than others. Function keys on both Compaqs are small and crammed together. The ThinkPad's are generously sized and have gaps between F4 and F5 and between F8 and F9 so you can find the key you want, even while you're glancing at the clouds out your airplane window.

All but the Compaq LTE Lite have a full set of dedicated document control keys—Home, End, Page Up, and Page Down. Only the IBM, the Zenith, the PC Brand, and the Compudyne and Twinhead units had Alt and Ctrl keys on both sides of the space bar. Most of the others left off a second Ctrl key, and the NEC UltraLite Versa and the Toshiba T4500C had only one of each key.

When it comes to pointing devices, our favorites were those built into the ThinkPad and the two Compaqs. The ThinkPad's pointing controller, called the Trackpoint II, looks like a pencil eraser jammed between the G, H, and B keys. Pressing the eraser head in any direction sends the Windows pointer scurrying along, sometimes too fast—it takes some getting used to. Two wide buttons below the space bar within easy reach of your thumbs serve as mouse buttons.

Both Compaqs use a trackball built into the right side of the screen panel so that your thumb diddles it on the front of the panel while your two fingers are poised over the buttons on the back. The ball and buttons are positioned perfectly for a comfortable fit—if you're right-handed.

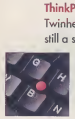
The AST PowerExec uses a hybrid device, not exactly built in, but not an add-on trackball either. It attaches to the front of the notebook, where you can easily reach it without moving your hands from the keyboard. It has all the advantages of a built-in pointing device.

The PC Brand LeaderBook Pro shamelessly copies the Apple PowerBook, with a trackball centered below the space bar that has buttons above and below it. The ball is easy to manipulate, and its placement creates a shelf below the keys where you can rest your palms, but we never got used to the placement of the buttons. Your thumb is always in the way of whatever finger you try to use to press a button. Button placement on the AST is far better.

A number of the other notebooks lacked built-in devices, much to our disappointment. The NEC UltraLite Versa, the Toshiba T4500C and the Zenith Z-Note use the Microsoft BallPoint Mouse or the Logitech TrackMan. Working with either of these devices is more awkward

THE ROAD TO THE ULTIMATE NOTEBOOK *(continued from page 187)*

But after all is said and done, we were still drawn irresistibly to the **IBM ThinkPad 720C**. It's not as fast as the Twinhead and the Compudyne, but it's still a solid performer and elegant to boot. The keyboard has a desktop keyboard feel, and its eraser head **pointing device** works smoothly. The **ThinkPad** comes loaded with PCMCIA slots and a removable, upgradable hard drive. Plus it's black and sleek.



Of course, you're not going to care about looks if weight is your number one concern. In the featherweight category, we really liked the **Gateway HandBook**. It's super light and has a no-compromises **keyboard**. But it doesn't run Windows.



IBM ThinkPad 720C

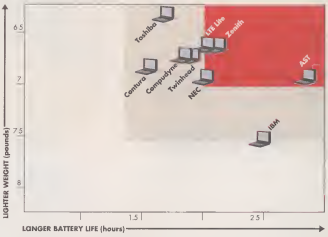


Gateway HandBook

We wanted to like the **Dell 320SLi** if for no other reason than its ultrastylish looks. If only it had a backlit screen.

LONGEST LIFE—AT A LIGHT WEIGHT

With IBM's ThinkPad, more battery life adds weight.
If you want your notebook to last all the way through a bad movie on a coast-to-coast flight, be prepared to carry some extra heft in return for the extra battery life.



Note: PC Brand's notebook is excluded from this test because the company was unable to supply a battery-powered notebook

than a snake doing headstands. And anything that bolts onto the side of a notebook PC is just one more piece of paraphernalia begging to get lost or forgotten. At least the Toshiba has a "hot port" that eliminates the cord that must otherwise run from the trackball to the mouse port.

PORTABILITY Let's not kid ourselves about heft on such full-powered, full-featured notebooks. None of the systems we looked at weighs less than 6 pounds—even without AC adapters. Add all the extras, and you're carrying around at least 7.7 pounds for the lightest of them—the Compaq LTE Lite—and about 9 pounds for the heaviest—the IBM ThinkPad. Similarly, none of the notebooks is appreciably less bulky than the others, ranging from the AST PowerExec and the Toshiba's 195 cubic inches to the NEC's 229.5. None is too big to fit in most briefcases or on an airplane tray table. But there's no way you'll think of any of these notebooks as petite.

Just as you give up lightness for CPU power and a beautiful display, so do you give up battery life. Active-matrix displays suck electricity from batteries like a bee attacking honeysuckle. High-powered 486 processors are also energy hungry. The best battery times in our rundown tests were achieved by AST PowerExec (nearly 3 hours) and the IBM ThinkPad (not quite 2½ hours). The AST's unique power-management scheme is heuristic—it analyzes your work patterns and adjusts power-management features accordingly.

If long battery life in a color notebook is your most important consideration, get the NEC UltraLite Versa. Its floppy drive is removable so that you can replace it with a second battery pack to double the 2 hours of run time you get from a single battery.

STORAGE, ADD-ONS, AND EXTRAS Hard drives for the notebooks we tested ranged in size from 120MB to approximately 200MB. The ThinkPad we tested had a maximum drive capacity of 160MB, though a 240MB version was scheduled for shipment this summer.



Zeos Contenda

The **Hewlett-Packard OmniBook 300** was cute as a puppy. Its **mouse-on-a-stick** pointing device was a hit, but with no floppy drive, it's too much of a pain to use LapLink to transfer files.





Hewlett-Packard OmniBook 300

The **Zeos Contenda** is also hot, with good performance and a keyboard to kill for—except for the all-in-a-row placement of **cursor keys**!

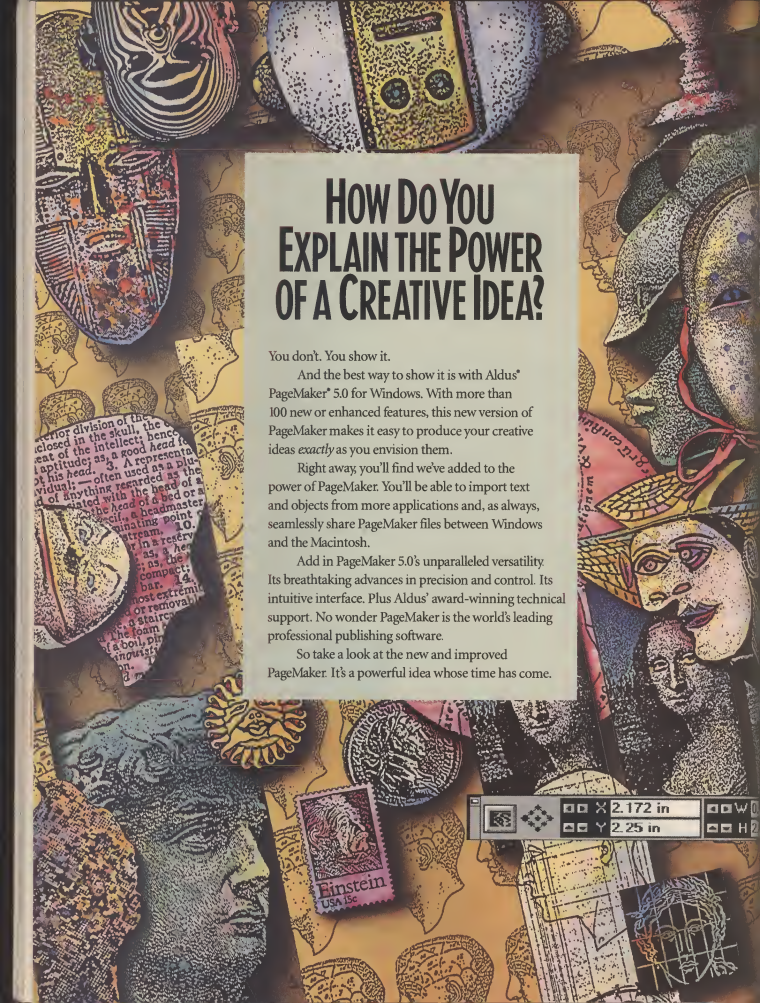
The **Zenith Z-Lite's** keys are hard and some are undersize, but cursor controls are in the right place, and it has the best **pointing device**.



But nothing in the pack tops the keyboard nar the speed of the **Compudyne 45L/25 SubNote**, the only one powered by a 486 processor—an all-around great choice for traveling light.



Campudyne 45L/25 SubNote



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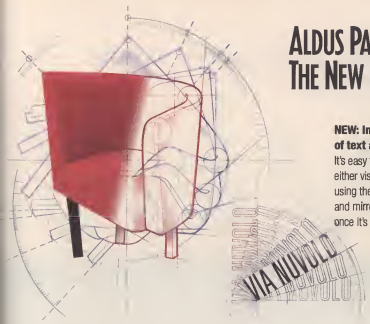
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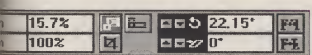
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ACTIVE-MATRIX 486 NOTEBOOKS: FEATURES AND RATINGS

A big display, a well-designed keyboard, and a usable pointing device are key features.

	AST PowerExec 4/25SL (800) 876-4278	Compaq Contura 4/25CX Compaq Computer Corp. (800) 345-1518	Compaq LTE Lite 4/25C Compaq Computer Corp. (800) 345-1518	IBM ThinkPad 720C IBM Personal Computer Co. (800) 772-2227	NEC UltraLite Versa 25C NEC Technologies (800) 388-8888	PC Brand LeaderBook Pro PC Brand (800) 722-7263
Price/price as tested	$4,199/$4,499	$3,500/$4,100*	$4,200/$4,800*	$4,695/$4,695	$4,269/$6,638	$3,295/$3,595
FEATURES						
Processor	486SL 25MHz	486SL 25MHz	486SL 25MHz	486SLC2 50MHz/25MHz	486SL 25MHz	486DX 33MHz
Max. RAM/as tested	32MB/4MB	20MB/4MB	20MB/4MB	16MB/4MB	12MB/4MB	20MB/4MB
Max. hard disk/as tested	200MB/200MB	209MB/120MB	209MB/120MB	160MB/120MB	180MB/120MB	120MB/120MB
PCMCIA slots	2 Type II	None	None	2 Type II or 1 Type III	2 Type II or 1 Type II	None
Screen size (diogonal in inches)	9.5	8.4	8.4	10.4	9.4	8.48
Pointing device	Trackball on front of keyboard.	Trackball on lower right side of display.	Trackball on lower right side of display.	Trackpoint II central stick embedded in keyboard.	Microsoft BallPaint trackball.	Trackball embedded below keyboard.
Internol modem	PCMCIA 14,400 data and fax	9,600 fax/ 14,400 data	9,600 fax/ 14,400 data	9,600 fax/ 2,400 data	PCMCIA 14,400 data and fax	9,600 fax/ 2,400 data
Extras	Removable hard drive; flash BIOS.	Onscreen icons for power gauges; user-upgradable RAM.	Onscreen icons for power gauges; user-upgradable RAM.	2 DRAM memory upgrade slots; removable hard drive.	Daubles as pen PC; local-bus video; removable hard drive.	User-upgradable RAM.
PORTABILITY						
Weight (lbs.)‡ System	6.9	6.7	6.5	7.6	6.8**	6.9
Adapter	1.3	1.1	1.2	1.5	1.8	1.7
Tatol weight	**8.2**	**7.8**	**7.7**	**9.1**	**8.6**	**8.6**
Dimensions (inches)	11.5 x 8.5 x 2	11.7 x 8.9 x 2.1	11 x 8.5 x 2	11.8 x 8.3 x 2.2	11.6 x 9.3 x 2.1	11.1 x 9.3 x 2
Battery life (hrs: mins)	2:52	1:34	2:04	2:23	2:02	N/A
PERFORMANCE						
WinTests (lower is better)	902	999	2,202	855	975	1,705
ZD Benchmorks (higher is better)	14,426.41	13,382.21	11,875.43	14,586.38	14,147.23	14,516.64
SUMMARY						
Pras	Handy trackball; fastest video performance.	Good trackball for right-handers; great warranty and support.	Good trackball for right-handers; great warranty and support.	Best display; top performance; great keyboard and pointer.	Most innovative of the notebooks and the only one to double as a pen PC.	Least expensive choice with an interesting display.
Cans	Cramped keyboard.	Average performer.	One of the warst performers.	Heaviest.	No built-in pointing device.	Disappointing performance considering its processor.
Verdict	A good bosic choice, but nat the best.	OK, but nat what we'd expect from Campaq.	*Definitely* nat what we'd expect from Campaq.	Our chaice for the ultimate notebook PC.	An OK performer that gets extra points for upgradability and versatility.	Go with this if you're on a tight budget.
				ULTIMATE NOTEBOOK		

	Toshiba T4500C Toshiba America Information Systems (800) 344-3445	Zenith Z-Note 425Lx: Model 200 Zenith Data Systems (800) 553-0331	486DX2/66 Color Slimnote Compudyne Direct Products (800) 882-3090	Slimnote 4DX2/60 Twinhead Corp. (800) 995-8946
	$3,799/$3,799	$3,999/$4,278	$4,499/$4,499	$4,795/$6,195
	486SX 20MHz	486SL 25MHz	486DX2 66MHz	486DX2 66MHz
	20MB/4MB	28MB/8MB	20MB/4MB	20MB/20MB
	200MB/120MB	200MB/200MB	210MB /210MB	210MB/210MB
	1 Type II	None	None	None
	8.5	8.4	8.5	8.5
	Microsoft BallPoint trackball.	Logitech Trock-Man portable mouse.	Built-in trackball.	Built-in trackball.
				
	PCMCIA 14,400 fax and data	14,400 fax and data	9,600 fax/ 2,400 data	9,600 fax/ 2,400 data
	User-upgradable RAM.	User-upgradable RAM; LCD gauges for power use; Ethernet port.	Memory.	Memory.
	6.9	6.5	6.7	6.3
	1.2	1.6	1.5	1.5
	8.1	**8.1**	**8.2**	**7.8**
	11.7 x 8.3 x 2	11.9 x 8.5 x 2.1	11 x 8.5 x 2.2	11 x 8.5 x 1.6
	1:42	2:08	1:52	1:55
	1,193	916	690	614
	11,344.49	13,550.02	21,329.00	21,362.00
	Among the lightest notebooks we tested.	Good performance.	Fast processor; OK keyboard; same as Twinhead.	Fastest benchmark scores; same as Compudyne.
	Most expensive of all the notebooks with maxed configurations.	Uncomfortable keyboard.	Mouse awkwardly placed; pointer ghosting.	Mouse awkwardly placed; pointer ghosting.
	Toshiba brand name is the strongest feature.	Network port makes it a good choice for a mobile and desktop PC.	Great bare-bones power—if you can live without the niceties.	The same powerful lion as the Compudyne, but in different clothing.

*No suggested retail price set These prices reflect manufacturer's approximate price
** NEC UltraLite Versa weighed with one battery and floppy drive. Weight with two batteries, AC adapter and no floppy drive is 9.3 pounds

The hard drives on the IBM ThinkPad, the AST PowerExec, and the NEC UltraLite Versa are removable, making an upgrade easy. All the notebooks come with a 3½-inch floppy drive; the NEC's floppy drive, as mentioned, can be swapped for a second battery. You can expect to see more notebooks using this crafty idea in the coming year.

Only four of the notebooks had PCMCIA slots, two each in the AST PowerExec, IBM ThinkPad, and NEC UltraLite Versa and one in the Toshiba T4500C. All of the notebooks with PCMCIA slots, except for the ThinkPad, also offer 14,400-bps modems as extras.

We particularly liked the LCD gauges on the NEC UltraLite Versa and Zenith Z-Note. You can tell at a glance what kind of power-saving scheme you're running and how much battery life you have left. Compaq's two notebooks do the same with pop-up onscreen icons. Finally, the Z-Note also deserves special mention for its built-in Ethernet port, a feature we'd like to see on more notebooks.

THE ULTIMATE NOTEBOOK When the dust had settled, we were still arguing about which notebook is best. The leading contenders turned out to be the Twinhead/Compudyne doppelgangers and the IBM ThinkPad 720C. The Twinhead and Compudyne are the undisputed performance champs, with the Twinhead edging out its cousin. If you use spreadsheet or graphics programs and count every nanosecond it takes to do a recalc or redraw a screen, you'll be happy with either machine.

But for the broadest range of road-bound computing tasks, get the IBM ThinkPad 720C. The ThinkPad scores not far behind the Twinhead/Compudyne in the real-world application tests, and its processor will soon be upgradable to a 66MHz version. Plus the 720C has the biggest display of any notebook on the market today, an excellent keyboard, and an unobtrusive but usable pointing device. Its 160MB hard drive can be swapped for the 240MB drive as soon as it's available, and it has the second-best battery life of the systems we tested.

Load the ThinkPad with Windows or OS/2 (supplied with it), double the disk space with DOS 6.0 or Stacker, and add your favorite applications. You've suddenly got the coolest notebook on the road. Carry it with pride through the corridors of JFK, LAX, Dulles, O'Hare, Logan. It's the ultimate tool for the road warrior, the last word in mobile computing. Unless ...

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THE OTHER ULTIMATE NOTEBOOK

If you're looking to clone your desktop system in a 9-pound package, the ThinkPad is a great choice. But your perceptions of the ultimate notebook PC change dramatically after you've made the day's third rush for a departure gate through a half-mile of crowded corridors. Then the weight and bulk of the ThinkPad changes from a minor drawback to a major burden.

That's when lightness, smallness, and unobtrusiveness define the ultimate traveling companion. You need a PC you can carry anywhere as easily as you tote your DayTimer. You need a subnotebook. But it has to be really usable, not one of those electronic personal information managers that make you type with your thumbs. At a minimum, it has to run basic DOS applications, preferably Windows programs. It must come with a conventional IDE hard drive for cheap, reliable, widely compatible storage. And it has to provide some convenient way to move data in and out of it, if not through a conventional floppy drive.

We found six subnotebooks weighing less than 5 pounds, not counting their power supplies or other peripherals: Compudyne's 4SL/25 SubNote, Dell's 320SLi, Gateway's 2000 HandBook, Hewlett-Packard's OmniBook 300, Zenith's Z-Lite 320L, and Zeos's Contenda. Each travels so comfortably in a briefcase side-pocket that you'd barely notice it was there. To arrive at such portability, however, subnotebooks make innovative—sometimes strange—compromises. Some use external floppy drives, for example; others have none at all. We discovered that the road to ultralightweight is bumpy indeed.

PORTABILITY Low weight and small size are the chief reasons to consider a subnotebook, and if they were the only criteria, the winner would be the Gateway HandBook or the OmniBook 300, depending on how you weigh them. Without accessories and AC adapter, the bare-bones HandBook is 2.75 pounds, a shade under the 2.9 pounds for the stripped-down OmniBook. The HandBook is also the smallest overall, with the OmniBook coming in second. *(Book* is an apt part of each of their names; both are slightly bigger than a paperback.) But with its external floppy drive and AC adapter, the HandBook weighs 5.25 pounds, compared with 4.68 pounds for the OmniBook with its adapter. (The OmniBook comes with no floppy drive whatsoever.)

Size and weight aren't the only considerations, however. If you want to do serious work on a PC, it needs to run Windows, which the Gateway HandBook simply can't do.

One good thing about subnotebooks is that they don't take a lot of juice for supercharged processors and displays. All of the units we tested provided longer life on a single battery than any of the 486 notebooks. The OmniBook had the longest rundown time—3 hours and 40 minutes in our tests with all power-management features turned off, primarily because it lacks backlighting. Not surprisingly the Dell 320SLi (which also lacks backlighting) lasted 3 hours and 36 minutes. Despite its 486 processor and backlighting, the SubNote managed a full 2 hours and 25 minutes of life. The HandBook and the Contenda, on the other hand, pared weight down by using small batteries, which provided 2 hours and 23 minutes and 2 hours and 15 minutes of life, respectively.

PERFORMANCE When portability is your most important objective, you can forgive a subnotebook for not being in the top ranks of performance. One machine we looked at, however, doesn't need to make any apologies—the Compudyne SubNote.

The SubNote is the only system in this group powered by a 486SL processor, running at a chipper 25MHz. It was the undisputed leader of the pack in our benchmark tests. The Zeos, which has a 25MHz 386 chip, came in second, with the 20MHz Dell not far behind. (A new Dell, the 325SLi, comes with a faster processor but wasn't available in time for our tests.) The Z-Lite and OmniBook essentially tie.

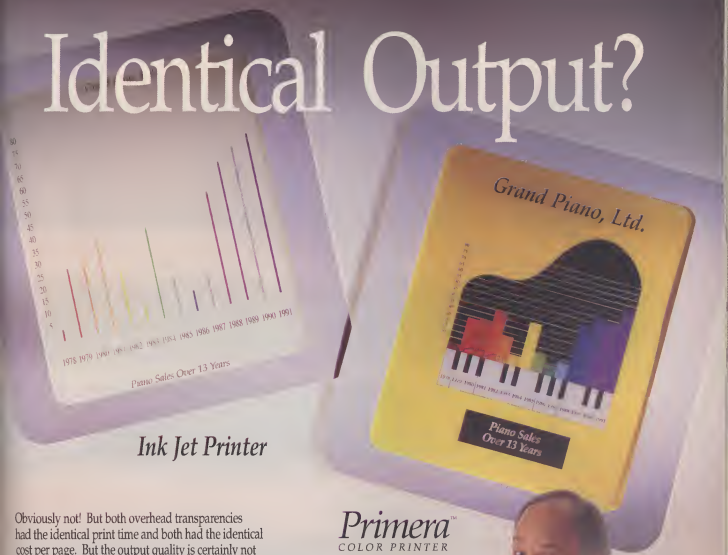
The Gateway HandBook, with its 286-clone processor, not surprisingly trailed the pack. You can't run Windows 3.1 on it at all. For undemanding DOS programs, such as communications software and WordPerfect for DOS—which can take advantage of the Gateway's 2MB of extended RAM configured as expanded memory—a 286 does the job nicely enough.

USABILITY The smallest and lightest PC is no good if you can't realistically touch-type on it. The good news: All six subnotebooks provide for true touch-typing, without fingers stumbling all over each other. The bad news: Well, there really is no bad news. But the news could be better yet. The Gateway doesn't have separate F11 and F12 function keys, but like the Zenith Z-Lite, it provides dual Alt and Ctrl keys (the only two subnotebooks to have them). The Gateway also forces you to use a special shift-*function key* combination to access the Home, End, Page Up and Page Down keys. All the other machines have dedicated keys for these functions.

The Zeos Contenda commits the worst sin of all: Cursor keys line up in a row, not in the inverted-T that is now as common as a QWERTY layout. The Contenda also uses single Alt and Ctrl keys. This is too bad; otherwise, we like the Contenda's key spacing and feel, which are comparable to the Compudyne SubNote's. All the subnotebooks compromise something in their keyboards—even the Z-Lite, which, like the SubNote, uses a small right shift key that's hard to find. In fact, the Z-Lite keys are all undersize and lack visual clues, such as key colors or groupings to help you pick out the cursor and function keys from the alphanumeric keys.

Two of the subnotebooks—the Dell and the Gateway—have no built-in mouse (since the Gateway can't

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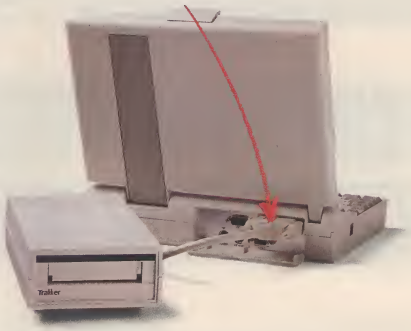
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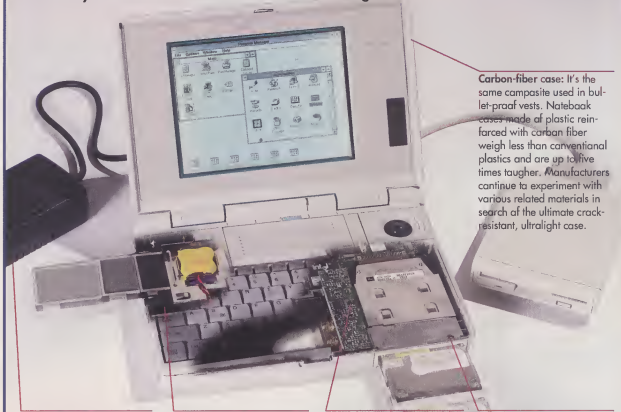
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Circle 184 on reader service card.

THE INCREDIBLE SHRINKING PC

How they make subnotebooks so small and light.



Carbon-fiber case: It's the same campasite used in bullet-praaf vests. Notebaak cases made af plastic reinfarced with carban fiber weigh less than canventional plastics and are up ta five times taugher. Manufacturers cantinue ta experiment with various related materials in search af the ultimate crack-resistant, ultralight case.

Pocket-size AC adapter: Once the heavy, unhappy surprise af a notebaak purchase, many AC adapters naw weigh anly a few aunces and take up na mare space than a packet madem. There's a limit ta haw far they can shrink, hawever. Canventianal magnets make up their greatest heft and bulk, and these have ta remain a certain size and weight ta wark efficiently.

Memory card: Memary cards require far less space—and pawer—than industry-standard SIMMs, yet they pravide the same performance. These dual savings became critical in natebaaks that pack 8MB ar mare af RAM. Memary cards can alsa double as lightning-fast, crash-praaf starage devices, saving half a paund ar mare af weight and several cubic inches af space.

Miniaturized power supply: The mare pawer a system requires, the larger its power supply. Low-pawer 3.3-valt campanents in natebaaks taday have already shrunk canventianal power supplies appreciably. Slatless, bayless natebaaks get by with 100-watt power supplies. As mare campanents switch ta the 3.3-valt standard, natebaak pawer supplies will shrink further.

2½-inch 80MB or 120MB hard drive: Generaus use af ASICs has reduced circuit-baard-size drive cantrallers ta twa ar three chips. Lawer pawer requirements af 2½-inch drives allaw drive matars ta shrink. Finally, mare saphisticated algarithms in drive firmware pack mare data an fewer, smaller platters than ever befare. Laak far 2½-inch 200MB drives by year-end.

run Windows, its missing mouse is no big loss). The OmniBook has one of the best ideas for a portable pointing device we've seen. Call it a mouse-on-a-stick. Press a button just above the keyboard, and a mouselike object pops out of the right side of the OmniBook. It hangs on a plastic lever that lets you manipulate the mouse as it if were sitting on a desktop. It's the only portable pointing device we've seen that requires no user retraining. If you can use a desktop mouse, this is a snap.

The Z-Lite's pointing device is not as imaginative, but it's still far better than most, even those found on bigger notebooks. It consists of a trackball located below the keys. The buttons located to the left and right of the ball are much easier to use than the arrangement of buttons above and below the trackball on the PC Brand Leaderbook Pro.

The Compudyne SubNote owes a debt to the Compaq screen-panel pointing device. It's located in the upper right above the keys, so that you control a trackball with your thumb, and your fingers fall naturally onto the buttons on the side of the case. Compudyne should make the buttons easier to find with your fingers.

The Contenda uses the kind of unthinking pointing devices that show up on many portables today. The trackball and its buttons are located between the keyboard and the screen panel. Extensive diddling with them means suspending your hand above the keys, an approach that quickly becomes tiring.

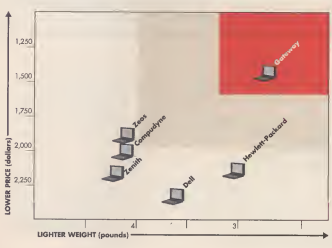
DISPLAY You won't see big, brilliant color screens on any of these subnotebooks. But at the very least you should expect them to be easily readable under any conditions. Unfortunately, two of them don't meet this essential criterion.

Both the Dell 320SLi and the HP OmniBook make the fatal mistake of not providing backlighting for their LCD screens. That's too bad, because both are such excellent portables in most other ways. The superlight weight of the OmniBook and its ROM-based programs do offer state-of-the-art portable computing, but the low-contrast LCD screen is just a pain. Although the Dell is not as innovative as the OmniBook, it has the biggest screen of all the subnotebooks. What a shame to waste all that real estate on a nonbacklit display.

Meanwhile, the Z-Lite's display, at 8.5 inches diagonally, is the largest of the backlit screens. Reading it is no problem, except for the pointer's tendency to disappear if moved too quickly. Still, it's the best among the subnotebooks we reviewed. The backlit SubNote didn't have the disappearing pointer problem, but in Windows the edge of the screen is strangely ragged, an effect that doesn't show up under DOS alone. The Gateway HandBook provides greater viewing area (measured diagonally), but its rectangular dimensions skewed the view. The Zeos Contenda and Compudyne SubNote provide more usable area overall.

LIGHTEST WEIGHT FOR THE MONEY

Sure a notebook can be superlight, but it may lack muscle.
The Gateway HandBook proves that featherweight subnotebooks don't have to cost more. But you pay for their lightness in other ways, like not being able to run Windows.



STORAGE, ADD-ONS, AND MORE While you can't expect a subnotebook to have all the features of a full-size notebook PC, disk storage on our roundup of systems is surprisingly large—up to 128MB on the Dell 320SLi. The Gateway and OmniBook have only 40MB drives. The non-Windows Gateway can get by with 40MB, especially after it's doubled with Stacker or DOS 6.0. And HP's OmniBook comes with DOS 6.0, Microsoft Word, Microsoft Excel, and Traveling Software's LapLink, among other applications in ROM. DOS 6.0 doubles actual hard drive capacity to 80MB, all of which is available for data, presuming that ROM-based applications are the only ones you use.

All but the HP OmniBook come with or offer the option of an external floppy drive—a sensible arrangement in these days when floppies are used primarily to install new programs or pass data files to another machine. The OmniBook has an infrared device to exchange data with HP's 100LX—or its forthcoming line of Vectra desktop PCs that will feature infrared as standard equipment. Other transfers require a null modem cable and the LapLink file-transfer program that's included in ROM. In many other ways the OmniBook is an exceptionally inventive subnotebook. If HP added an external floppy drive and a backlit screen, this would be a real contender.

The Compudyne, Dell, OmniBook, and Z-Lite also have PCMCIA slots for extra storage or devices, such as a modem. An internal modem is also available for the Zeos Contenda and Compudyne SubNote.

THE ULTIMATE SUBNOTEBOOK We're torn between the Gateway HandBook and the Compudyne. We travel splendidly with the Gateway and a good DOS communications program to check e-mail. One *PC/Computing* editor carried the HandBook around a week-long trade show to take notes in WordPerfect for DOS, and he found the HandBook a perfectly good arrangement—but only because he had a ThinkPad back at the hotel running Windows so that he could check messages in Lotus Notes back at the office.

If you're budgeting for only one portable system, opt for the Compudyne SubNote. It's got fast processing, a good keyboard and usable pointing device, and an easy-on-the-eyes display. It's got everything except color, heft, and hulk.

The decision of whether to go with the power of the ThinkPad or with the portability of the SubNote should ride on the amount of travel you do and the number and type of applications you use on the road, not to mention the constraints of your budget. Given the downward slide in portable PC prices over the last year, why not get both machines? We would.



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Price/price as tested	$1,399/$2,348	$995/$1,125	$1,950/$2,049	$1,999/$3,165	$1,495/$1,894	$1,999/$2,138
FEATURES						
Processor	386SL 20MHz	C&T F8680 10MHz	386SXLV 20MHz	386SL 20MHz	386SL 25MHz	486SL 25MHz
Max. RAM/as tested	10MB/10MB	3MB/3MB	8MB/2MB	6MB/4MB	10MB/4MB	20MB/4MB
Max. hord disk/as tested	120MB/120MB	40MB/40MB	40MB/40MB	60MB/60MB	80MB/80MB	80MB/80MB
PCMCIA slots	1 Type II	None	4 Type II	2 Type II	None	1 Type II
Screen type	Nonbacklit VGA	Backlit CGA	Nonbacklit VGA	Backlit VGA	Backlit VGA	Backlit VGA
Screen size (diagonol)	9.5 inches	7.6 inches	9 inches	8.5 inches	7.4 inches	7.4 inches
Pointing device	None	None	Mouse attached on stick on right side.	Trackball embedded below keyboard.	Trackball embedded in upper right of keyboard.	Trackball embedded in upper right of keyboard.
PORTABILITY						
Weight (lbs.): System	3.60	2.75	2.90	3.90	3.90	4.08
External drive	0.78	1.30	0.78	0.70	0.72	0.95
AC adopter	1.00	1.20	1.00	0.60	1.00	1.59
Totol weight	**5.38**	**5.25**	**4.68**	**5.20**	**5.62**	**6.62**
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Bottery life (hrs: mins)	3:36	2:15	3:40	2:58	2:23	2:25
PERFORMANCE						
Hord disk (lower is better)	14.72	57.41	75.54	54.61	10.82	60.93
Totol (lower is better)	187.93	354.03	263.47	228.6	154.93	98.65
SUMMARY						
Pros	Sleek, cool high tech look.	Light, handy, and cheap; includes WordPerfect 5.1.	Wonderful, clever mause; Windows, Word for Windows, Excel, and other software in ROM, compact.	OK screen; ultra-cool design.	Good feel to keyboard; good display.	Fast; bright screen; LCD power gauges and a good, big keyboard feel.
Cons	Nonbacklit screen.	Can't run Windows.	Nonbacklit screen; awkward to transfer files.	Keys are small and have little travel; trackball extension could be damaged by raugh handling.	Cursor keys are badly arranged; trackball difficult for sustained use.	Trackball is awkward; not well placed for left-handers.
Verdict	The screen is reason enough not to get this one.	If you can get by without Windows, getting this is a no-brainer.	Wait until HP puts out a backlit display.	Everything anyone could need on the road, short of a color display.	A good alternative to the Zenith Z-Lite. Some will like the Zeos keyboard better.	A subnotebook with notebook power and feel. A winner. ULTIMATE SUBNOTEBOOK

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BY JOE SALEMI

When it hit the streets in 1991, Telebit's tiny V.32bit QBlazer modem forever changed portable PC communications. Small and lightweight, it gave traveling businesspeople the same high-speed communications capabilities they enjoyed from the office. It didn't take long for other modem manufacturers to jump on the bandwagon: Users now have a cornucopia of pocket modems to choose from.

We looked at 11 high-speed portable modems, eliminating those that were larger than 6 by 3 by 2 inches as too big; those that didn't conform to the V.32bis specification as too risky for business communications; and those that didn't run off batteries as too limited in functionality. Someday, PCMCIA modems may be the standard. But we looked at more conventional form factors, which work with every notebook and desktop PC you can buy.

Everyone benefits from high-speed data transmission in time saved downloading or uploading files and in reduced phone bills and connect charges, but business budgets and travel needs still vary widely. That's why our top picks are modems that excel in each of three areas: top performance, best performance for the price, and best price. We tested data transfers using a 500K file under the Zmodem protocol, and we tested faxes with the modem maker's fax software.

WHAT TO LOOK FOR Modem performance is largely determined by communications protocols. High-speed transmission is made possible by the CCITT V.32bis specification, the leading edge for business data communications. V.32bis modems all have two key characteristics: 14,400-bit-per-second data rates and support for V.42 error control and V.42bis data compression. Though V.32bis doesn't require it, modems that conform to the specification also support the alternate MNP 4 error-control and MNP 5 data-compression standards. Taken together, these protocols ensure the fastest trouble-free data communications available today.

Ten of eleven modems reviewed also provide fax support in accordance with the Group III fax standard. All V.32bis fax modems support the Class 1 standard for communications between application and modem. Some



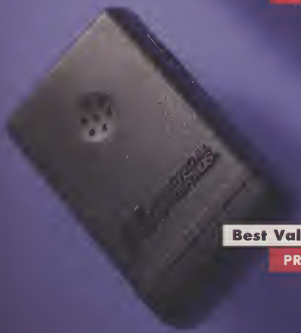
Best Performance

MICROCOM MICROPORTE 4232BIS WITH FAX



Best Price

BAY CONNECTION SPECTRA-COM P1496MX



Best Value

PRACTICAL PERIPHERALS PM14400FX PKT

also support the proposed Class 2 standard, which isn't established yet (and may require a ROM BIOS upgrade in modems currently on the market). For now, Class 1 provides the widest—though hardly comprehensive—support for the fax packages available today. It's your best bet in third-party software.

The most impressive feat of pocket modems is their ability to pack this much communications capability into a package that's smaller and lighter than a paperback novel. Most that we reviewed weigh no more than a half-pound (including batteries). Honors for light weight go to the Practical Peripherals PM14400FX PKT (4.2 ounces) and the Megahertz 14,000 Pocket Data/Fax Modem (5.5 ounces). The heaviest we tested were Microcom's MicroPorte 4232bis (10.5 ounces) and Multitech's MultiModem[II] MT1432 MU (8.5 ounces).

But add an external power supply, along with the data cable and perhaps an extra battery, and suddenly your tiny, lightweight modem begins squeezing out running shoes for space in your luggage. When buying a pocket modem, size up its requisite attachments as well, keeping in mind their total bulk and weight.

Power is also a persistent problem for road-bound computing devices. Batteries should provide enough power for an hour of nonstop use to give you time to transfer the largest files or faxes you'd usually send from the road. They should also be common types—nickel-cadmium or alkaline—so you can replace them easily.

Ease of use is paramount with portable modems: You don't want to spend more time fussing with physical connections between notebook and modem than you spend online. Look for a 9-pin female RS-232 connector that attaches to standard serial ports. Proprietary attachments are more trouble than they're worth; of the modems we tested, only the U.S. Robotics WorldPort and Archtek America's SmartLink 1414PAV lacked an RS-232 connector. Incidentally, a 9-to-25-pin adapter is handy if you want to use the modem with a desktop system offsite.

BEST PERFORMANCE



MicroPorte 4232bis with fax

Microcom

$699

500 River Ridge Dr.
Norwood, MA 02062-5028
(800) 822-8224
(617) 551-1000

Includes: *Built-in rechargeable battery; 9-pin and 25-pin RS-232 connector cable; phone cord; external power supply; DOS-Fax Lite and WinFax Lite software.*

The modem's default configuration should be set at the factory so that you can just open the box, plug the modem in, and go. Better modems come with basic communications and fax programs with default configurations for that modem. No one should have to become a telecommunications expert just to reach MCI Mail, the company network, or a client's fax machine.

Only Telebit's QBlazer Plus included a data-communications program but not fax software. And Microcom's MicroPorte 4232bis lacked a communications program. All others we tested have software for both fax and data transfers.

The modem also should give you feedback on what's happening during the communications link. LEDs on the modems are a definite plus for identifying problems. At a minimum, the LEDs should indicate if the computer is talking to the modem, if it detects a carrier, and if the batteries are running low. Every modem we tested except the Megahertz included these indicators. Additional LEDs like those found on the Multitech, the Telebit, and the Practical Peripherals can tell you the status of the communications link, such as whether the modem is transmitting or receiving data, and at what speed.

A final factor—often overlooked—is the ergonomics of the device. Though the perfect design is a matter of personal taste, a few simple features make one modem easier to travel with than another. Cables, for example, should be long enough to let you put the modem where you can see the LEDs and hear the speaker. Also, a case for carrying the modem, the power supply, and the cables keeps you from scrounging through your briefcase for the various attachments. Finally, a second RJ-11 phone jack lets you attach both phone and modem, so that you're not constantly groping behind the desk or hotel bed to plug and unplug phone lines. All the modems we tested—except the Multitech, the Telebit, and the Megahertz—come with two RJ-11 jacks.

BEST PERFORMANCE Without question, the modem that has everything today's traveling businessperson needs to communicate from anywhere is the $699 MicroPorte 4232bis with fax from Microcom. In addition to full V.32bis and Group III 9,600-bps fax support, the modem features a built-in NiCad battery pack, remote configuration capabilities, and support for sending data and faxes over cellular phone connections.

The MicroPorte weighs in at 10.5 ounces and mea-

sures 4.5 by 2.75 by 1.5 inches. It has a 9-pin female RS-232 connector, an on/off switch, and a connector for the external power supply. The modem comes with two RJ-11 jacks, and four LEDs on top indicate power, low battery, speed, and data terminal ready (DTR) status. The modem comes with a 16-inch cable that has a male 9-pin connector on the modem end and both 9-pin and 25-pin female connectors on the computer end. Microcom also includes a copy of Delrina's DOS-Fax Lite and WinFax Lite in the package.



BEST VALUE

PM14400FX PKT
Practical Peripherals
$499

375 Conejo Ridge Ave.
Thousand Oaks, CA 91361
(800) 442-4774
(805) 497-4774

Includes: *External battery case and 4 AA batteries; 9-pin RS-232 connector cable; phone cord; external power supply; padded leather carrying case; QuickLink II Win/DOS Fax software.*

The built-in nickel-cadmium battery provides enough power for about 2 hours of constant use and takes 10 to 12 hours to recharge. The modem features a user-configurable sleep mode that shuts power off after a period of inactivity to prolong battery life. The Low Battery LED begins flashing when 10 minutes of power remain, and you can configure the modem to beep when the battery is low.

The remote-configuration feature is convenient—you can change the modem's configuration through an online link. This is handy when using the modem as half of a remote-control connection or on a central host system. The remote configuration can be password-protected. The modem can also be password-protected to prevent unauthorized MNP access to the system it's connected to. You can even program an automated log-on sequence, including user IDs and passwords, into the modem.

The MicroPorte is the only modem we tested with built-in support for cellular phones, provided primarily by the advanced MNP 10 protocol—what Microcom calls Adverse Channel Enhancements (ACE). It will make several attempts to connect during the link negotiation to compensate for poor-quality connections. ACE automatically adjusts the speed of the connection upward or downward and raises or lowers the transmit level to compensate for fading over a cellular link. Unfortunately, cellular modems at both ends of the connection must support MNP 10. Fax communications will generally work fine over cellular links, though they may suffer from fading effects.

With its built-in remote-configuration control, rechargeable battery, and support for sending data and faxes over cellular phone links, the MicroPorte 4232bis with fax is state of the art for portable communications today.

BEST VALUE At $499, Practical Peripherals' PM14400FX PKT provides all the general communications features most business travelers need. Lightweight and small, this V.32bis modem also has 14,400-bps Group III Class 1 fax capabilities. It has a full set of LEDs and a top-mounted speaker for monitoring the progress of the call or for diagnosing problems. Our only complaint with the modem is the external battery case: It takes four AA batteries instead of the more common single 9-volt battery. However, this problem is more than offset by the company's lifetime warranty policy—unique among modem vendors.

The PM14400FX PKT weighs only 4.2 ounces and measures 4 by 2.5 by 1.25 inches. Across the front are eight LEDs. The on/off switch is on the side, and on the back of the modem are two interchangeable RJ-11

BEST PRICE

Spectra-Com P1496MX
Bay Connection
$299

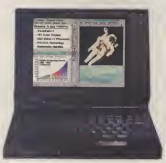
P.O. Box 610068
San Jose, CA 95161
(800) 475-8329
(408) 270-8070

Includes: *9-volt battery; 9-pin RS-232 connector cable; phone cord; external power supply; vinyl case for the modem; COMit DOS communications software and COMit Fax for Windows.*

For minds that cover a lot of ground, we present a more advanced way to travel. The new IBM ThinkPad® 720s. Notebooks so graceful, their sleek design and slim profile almost defy their sheer might. Memory is expandable to 16MB. Removable hard disks up to 160MB are available. And rocket-fast IBM 486SLC2 50/25 MHz processors speed things along, so you work in a virtually wait-less state.

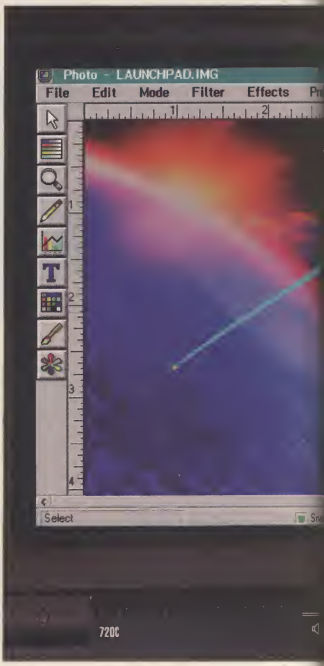
Introducing

ThinkPad 720



Everything about the 720 and 720C was designed to close the chasm between mind and machine. The rubberized red button on the keyboard is the exclusive TrackPoint™ II pointing device. Just a touch sends the cursor where you want it to go. The 720C draws you in even more with a dazzling 10.4" color, active-matrix, TFT display—the largest color notebook display out there.

Other forward-thinking features include the new



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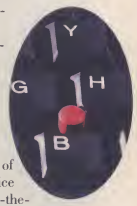
Think of it as for yo





Take advantage of PCMCIA cards.

generation of PCMCIA credit-card-size adapters. Simply slide one in to connect via modem, LAN or host network. A Port Replicator or Expansion Unit easily adapts your ThinkPad to office-bound environments. And besides delivering long battery life, the 720s even have the presence of mind to shut down and save your work when the battery is low.



To put your mind at ease, there's a three-year international traveler's warranty*, optional on-site service and ThinkPad EasyServ™**—the most convenient service around. It's all part of IBM HelpWare®—a wide range of service and support that also includes around-the-clock telephone assistance and a 30-day money back guarantee.* And every ThinkPad comes with "Thank You's from ThinkPad"—a booklet packed with nearly $4,000 in discounts on a host of valuable mobile products and services.‡

ThinkPad	720C	720
Processor	486SLC2 50/25 MHz	486SLC2 50/25 MHz
Display	10.4" Active Matrix 256 Color @ 640x480	9.5" Monochrome 64 Grayscale Screen
Battery Life††	2.4-4.8 Hours	3.8-7.5 Hours
PCMCIA Support Release 2.01	(1) Type III or (2) Type II's	(1) Type III or (2) Type II's
Warranty	3 Years (International)	3 Years (International)

††Depending on usage and configuration.

For more information or for an IBM authorized dealer near you, call our Personal Systems HelpCenter® at 1 800 772-2227 or TDD/ASCII 1 800 426-4238. In Canada, call 1 800 465-7999. Thanks to the ThinkPad 720s, choosing the ultimate notebook is hardly rocket science.

IBM®

a launchpad ur mind.

NO-HASSLE SOLUTIONS FOR KEEPING FILES IN SYNC

Every file and application on your desktop PC is just a phone call away.

Many of us use more than one system during the course of a day or week, and keeping files in sync across multiple PCs is no small challenge. Unexpected occasions orise when the current version of the file you need resides on another PC that's hundreds—sometimes thousonds—of miles away.

There are several solutions for remote file retrievol—and for synchronizing files between partable and desktop PCs as painlessly as possible. Most communications progroms, for exomple, feature a *host mode*, essentiolly a scaled-down BBS program that lets you send and receive files, and leave messages that others can read and reply to. All you need to do is load the program, then invoke its host mode before leoving the office.

Unfortunately, basic communications programs lack security. Anyone wha diols into your system automatically gets access to all of it, including confidentiol files. Some host modes let you restrict access to DOS; others limit uploads and downloads to certain directaries. But as security goes, that's cold comfort.

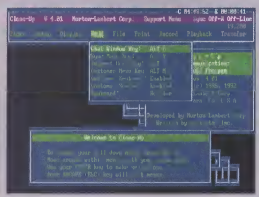
A better solution—a remote-control program—typically comes in two ports: the host and the remote. When you connect to the host via modem, you see exoctly whot's on its screen ond can access the host system as if you were sitting at its keyboard—even though you're miles away. You can transfer files between the two systems and even run an application from afar.

The best basic remote-control pragram under DOS is Norton-Lambert's Close-Up (Norton-Lambert Corp.; P.O. Box 4085, Sonta Barbara, CA 93140; 805-964-6767; $199). It consists of two executable files—one for the host and the other for the guest. The files are small enough to be run from o 360K disk. Close-Up was originally designed to enable technical-support personnel to call a user's system and help with o problem, so it calls the host side "customer" and the guest side "support."

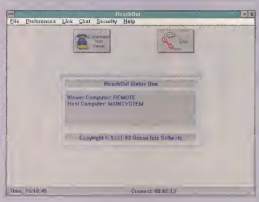
The pop-up menu for the support program showcases some of the features that give Close-Up its edge. You can record and play back screens and keystrokes from the host system on your remote PC, for example. Also, you can scroll through directories on either PC and tag files to be transferred. Finolly, Clase-Up's proprietory file-transfer protocol is fast—a key consideration for remote-control pockoges, which, as a closs, tend to be woefully slow.

While Close-Up enobles you to run Windows applications remotely, Ocean Isle's ReachOut Remote Control (Ocean Isle Software; 1201 19th Place, Vero Beach, FL 32960; 800-677-6232; $179) provides for better Windows support. ReachOut comes with DOS and Windows versions in the some package. Richer in features thon Close-Up, ReachOut scons files for o variety of viruses as they're being transferred (updated virus signature files are available on a support BBS). Also, ReachOut supports file transfers in the background.

The program lets DOS users run Windows screens at up to 800-by-600 resolution, though only in 16-color mode. Yau con even use o mouse on the guest system to contral Windows on the host. Its chief drawback, however, is speed: ot 2,400 bps, redrawing o DOS screen on the remote system is slow, but acceptable. But redrawing Windows screens is intolerable. To run Windows remotely, you need at least a



Clase-Up offords the simplest remote control. Optians an the guest PC let yau cantral the hast, record and play back the screens and keystrakes an the hast, and transfer files.



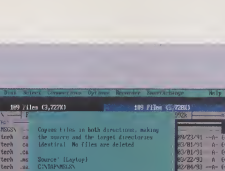
The Windows versian of ReachOut is included in the same package. You can use it as a hast system ta run Windaws apps fram a remate DOS system ar as a guest system ta run the applicatians an anather hast.

9,600-bps modem on each end.

Both DOS and Windows versions of ReachOut let you communicate with any drives the host program has access to, including files and applications on a LAN. You'll want to be sure to load the host software before running the LAN's log-in program. That way, you have to successfully connect to the host first, and then log in to the LAN through the remote link. This prevents you from leaving your host system logged into the network when you're not around.

A network version of ReachOut gives you the same host/guest capabilities across a LAN. You can dial into a host ReachOut system, and then load the LAN version of the guest software to connect across the cable ta another ReachOut host and run an application there.

Both DOS and Windows versions will reboot the host PC after a remote system hangs up, if you desire. This is handy when an application an the host inexplicably locks up. In most cases, the remote-control software regains control of the system after you hang up, forcing a warm reboot. Just make sure the commands that launch the host portion of ReachOut are included in your AUTOEXEC.BAT file.



LapLink's built-in synchronization capability reads the specified directories on both systems and automatically transfers the latest version to the right directory. The two-way process ensures that both systems have the exact same files.

Some users find it more convenient to keep files in sync by making duplicate copies of files an all PCs—which is easier said than done. One way is to keep all files on the server, then buy a parallel-port LAN adapter for your portable PC. A simple batch file (see Help, DOS, page 259) can automate the synchronization.

An easier solution is to use a file-transfer package; one of the best is Traveling Software's LapLink V (Traveling Software; 18702 North Creek Pkwy., Bothell, WA 98011; 800-343-8080; $169.95). The package includes a serial cable with 9-pin and 25-pin connectors on both ends, as well as a dual-ended parallel-port cable for high-speed connections. You can also use a modem to connect systems, which gives you some of the benefits of a remote-control package. LapLink even clones itself over a phone line if the other system doesn't have the software installed.

Using LapLink may seem like more trouble than simply copying the files to a floppy. However, it has one key advantage: built-in synchronization capability. Tell it the names of the directories on the two systems, and LapLink automatically reads both directories and transfers the latest file versions to whichever directory needs them. The process even works across a modem link. It's your insurance that you're working with the latest file version—na matter where you are.

Log In from Anywhere

Network modems let you dial directly to the server.

Reaching your LAN via a host PC is slow and kludgy at best. A better—though imperfect—solution is to dial into the server directly via a network modem, such as Shiva's LANRover or Centrum Communications' Centrum-Remote. They provide direct access to group calendars, client/server databases, network printers, network faxes, and a host of other network tools.

Both products come in token-ring, ethernet, and AppleTalk versions. They use their own drivers to trick the remote PC into thinking it has a LAN card—your remote system needs no hardware other than a modem. While remote networking servers retrieve files far faster than remote-control packages, they're still limited to the top speeds of phone lines and modems (about 57.6 Kbps). As such, running applications remotely is slow—especially those that rely on overlays.

Both LANRover and CentrumRemote come without modems, though each supports 90 or more common models. LANRover comes in a 4-port ($1,999) and an 8-port ($2,999) version; CentrumRemote comes in a 4-port ($3,495) and 16-port ($6,295) version. Each modem port requires a separate line. As a rule of thumb, figure on 10 users for every modem line. Contact Shiva Corp., Northwest Park 63 Third Ave., Burlington, MA 01803; 800-458-3550. Centrum Communications; 2835 Zanker Rd., San Jose, CA 95134; 408-894-1800.



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Verbatim® tapes, optical and floppy disks. Your best defense against data loss.

Circle 143 on reader service card.

PORTABLE MODEMS: FEATURES AND RATINGS

Little touches make the difference between pocket modems.

	MultiModem® MT1432MU Multitech Systems (800) 328-9717	QBlazer Plus Telebit Corp. (800) 835-3248	14,400 Pocket Data/Fax Modem Megahertz (800) 527-8677	PM14400FX PKT Practical Peripherals (800) 442-4774	WorldPort 14,400 Fax/Data Modem U.S. Robotics (800) 342-5877	WorldPort 14,400 Data Modem U.S. Robotics (800) 342-5877
Price	$699	$599	$499	$499	$649	$599
FEATURES						
Fax speed (send/receive)	14,400/9,600/4,800	9,600	14,400	14,400	14,400	N/A
Battery type	9 volt	9 volt	2 AA	4 AA	9 volt	9 volt
RJ-11 connectors	1	1	1	2	2	2
LEDs	•	•	o	•	•	•
Speaker	•	•	o	•	•	•
Weight (ounces)	8.5	6.5	5.5	4.2	7	7
Software						
Communications	DOS MultiExpress	QuickLink	MTEZ	QuickLink II Win/DOS	DCA Crosstalk Communicator	DCA Crosstalk Communicator
Fax	DOS Multi-ExpressFax	N/A	Eclipse	QuickLink II Win/DOS	WinFox Lite	N/A
SUMMARY						
PROS	Auto switch setting; remote configuration; UNIX UUCP support.	Small; includes Mac and PC cables; uses standard AT command set.	Power comes on automatically.	Lifetime warranty; on/off switch; clear LEDs; standard AT command set.	Standard RS-232 port; turns on only when PC is powered; remote configuration.	Same features as Fax/Data Modem without the fax.
CONS	Small LEDs; proprietary extension to AT command set.	No battery-saving features.	No LEDs.	Uses 4 AA batteries; external battery case.	Uses proprietary extensions to AT command set.	Uses proprietary extensions to AT command set; expensive.
VERDICT	Supports UNIX; expensive.	V.32bis version of QBlazer; low price.	Buy only if weight is a key concern.	Best pocket modem for everyday use.	Standard RS-232 port makes this the leader.	Cheaper than WorldPort but still expensive.
				BEST VALUE		

phone jacks, the power connector, and a 9-pin DIN connector for the external serial cable. The battery pack and the external power supply plug in to the same power connector. Alkaline batteries deliver about an hour of constant communications; rechargeable batteries are good for about 20 to 30 minutes of use.

The modem comes with a 19-inch cable that has a 9-pin female RS-232 connector. The package also includes the QuickLink II Win/DOS Fax communications and fax software and a padded leather carrying case for the modem, battery pack, cables, and power supply. The case has a Velcro strap on the back that can be attached to the shoulder strap of a computer carrying case.

The PM14400FX PKT is easy to set up and use. The default configuration is set to automatically negotiate the best connection protocols at the highest speeds. Just plug the cable into the PC and modem, turn the modem on, and dial away. The software supports common communications and fax programs, as well as the Xmodem, Ymodem, and Kermit file-transfer protocols. The modem supports the standard AT command set and Hayes high-speed extensions, so you should easily find a default configuration in the communications program you prefer.

The LEDs make it easy to monitor the modem's sta-

	SmartLink 14.4SPAV Archtek America (818) 912-9800	MicroPorte 4232bis with fax Microcom (800) 822-8224	Spectra-Com P1496MX Bay Connection (800) 473-8329	UFOMate P1496MX E-Tech Research (800) 328-5538	UFOMate P1414MX E-Tech Research (800) 328-5538
	$349	$699	$299	$299	$349
	14,400	9,600	9,600	9,600	14,400
	9 volt	nickel-cadmium	9 volt	9 volt	9 volt
	2	2	2	2	2
	•	•	•	•	•
	•	•	•	•	•
	6	10.5	6.5	6.5	6.5
	ArchCam	N/A	COMit	QuickLink II WIN Fax	QuickLink II WIN Fax
	ArchFax+	DOSFax Lite, WinFax Lite	COMit Fax for Windows	QuickLink II WIN Fax	QuickLink II WIN Fax
	Standard RS-232 port; inexpensive.	Built-in battery; cellular support; timer to turn power off.	Full-featured; 5-year warranty; same model as UFOMATE; inexpensive.	Small; easy to use.	14.4-Kbps fax support; moderate price.
	No cables, too large for direct connection to most PCs.	Most expensive and heaviest modem.	Standard command set; limited LEDs.	Standard command set; limited LEDs.	Unusual command set.
	Inexpensive; no cables; bulky.	Top of the line for pocket modems.	Best for casual, budget-minded users.	Get the Spectra-Com version.	Unless you need 14.4-Kbps, get the Spectra-Com.
			BEST PERFORMER BEST PRICE		

tus, and the top-mounted speaker is audible even in noisy environs. Other V.32bis modems may be close to Practical Peripherals' PM14400FX PKT in price, but none matches its features. Though we didn't like the external battery case, the modem's size, features, and lifetime warranty make it the best buy for most users.

BEST PRICE Bay Connection's Spectra-Com P1496MX is a relabeled version of E-Tech Research's UFOMate P1496MX. Though they're functionally identical and priced the same, the Spectra-Com comes with a five-year warranty—three years more than the UFOMate. "UFOMate" is a good description of both modems: They resemble a disk with a flattened end. The Spectra-Com has both V.32bis data and Group III Class 2 fax communications. Faxes are limited to 9,600 bps, which is sufficient for casual use. The modem has an unusual command set, which may require some fiddling with your communications program to get everything working properly. Overall, it provides solid, basic communications at a very affordable price.

The Spectra-Com measures 4.5 by 4 by 1.25 inches and weighs only 5 ounces. When you add the internal 9-volt battery, the weight nudges upward to 6.5 ounces. The rounded side of the case has the power connector, and the flat side has the on/off switch, a 9-pin DIN connector, and two phone jacks. There are four LEDs on the top of the case. The low-battery indicator flashes when about 10 minutes of power remain. An alkaline battery permits about 2 hours of constant communications, and the modem has an automatic sleep mode that reduces power consumption to the minimum when there's no activity on the TRANSMIT or RING lines.

A 36-inch serial cable comes with the unit. Bay Connection also includes a copy of the COMit DOS communications software and COMitFax for Windows in the package. A small vinyl case for the modem is included, and a five-year warranty is standard.

The Spectra-Com's only quirk is its unusual command set and return codes. Though mostly compatible with standard AT commands, the basic command set requires that you add a numeric character (1 to 4) to the AT&V command in order to read the modem's settings. The quirks are in the extended command set that controls advanced features such as data buffering, error control, and flow control. The Spectra-Com uses AT$ as the prefix for these commands, instead of the more common AT\ or AT&. You'll most likely have to create your own initialization string if you use a different communications program.

The return codes are also unusual. Most modems add /REL or /ARQ after the connect speed to indicate a V.42 or MNP 4 connection. The Spectra-Com returns LAPM/V.42bis and ALT/MNP 5, respectively, indicating the V.32 standard's alternative names for the protocols. Some communications programs expect the more common codes and may not function properly with the Spectra-Com if they can't be adjusted to match the modem. However, the default configuration is set for the majority of high-speed and standard connections, so most users won't have to deal with these problems.

The Spectra-Com P1496MX is a solid, basic V.32bis modem with the features a casual user needs most. If you can live with its quirks, the $299 list price can't be beat.

Joe Salemi is a free-lance writer in Alexandria, Virginia, who specializes in communications issues.

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Portable PRINTERS *with* Amazing Output

Get PostScript quality from a box that weighs less than your shaving kit.

BY PEGGY WALLACE

For some businesspeople, a notebook PC is only part of the traveling technology road show. Converting facts and figures into hard copy that customers can pore over and mark up is just as important. Why not get the contract signed at the moment you close the deal? Portable printers are the solution, whether you're thousands of miles from the home office or calling on clients in homes or offices across town.

Obviously, a printer that's going to travel should come in a small, light package and use a battery that has enough juice to let you produce several pages of documents—or let you leave the AC adapter at home. But these aren't the only considerations in choosing a portable printer. Another is output quality: After all, if the documents you produce look good, so do you. And you want to be able to produce high-quality output with ease, so that you can focus on business instead of technology. Also, all of us live within budgets; finding the printer you need within your price range can be a real challenge.

In selecting the printers to review, we required that each either come with a battery or offer one as an option. We didn't set a limit on weight; the printers range from 2.5 to over 8 pounds. We ended up with 11 that represented three types of print technology. Six were ink jet printers: Hewlett-Packard's DeskJet Portable, Kodak's Diconix 701, and the nearly identical Brother International HJ-100i, Canon's BJ-10ex, IBM's 4070IJ, and Star Micronics' StarJet SJ-48. Citizen's PN48 and the identical IBM Portable Printer, as well as Mannesmann Tally's two entries, the MobileWriter and the MobileWriterPS, use a print method called thermal fusion or thermal transfer, which uses heat to bond toner onto the page. Seikosha's LT-20XL is a 24-pin dot matrix printer.

We tested all the units by printing a two-page business letter to determine the average speed. We compared these pages, as well as graphics output, to judge print quality. Keeping in mind their purpose as portable technology, we fit each printer in a briefcase to see how comfortable it would be to tote on an extended trip. And we reviewed their manuals, pushed their control-panel buttons, and flipped dip switches to assess their capabilities and gauge their ease of use.


Best Price
STAR MICRONICS STARJET SJ-48
Best Performance
MANNESMAN TALLY MOBILEWRITERPS
Best Value
CITIZEN PN48 NOTEBOOK PRINTER

What we discovered is that there's enough variety among printers to provide a good match for almost anyone's printing needs. Portability will always exact some trade-offs: Output quality, while usually quite good, won't cause you to forget the laser printer back at the office, and you won't, in most cases, get anywhere near the print speed those bigger devices offer. These caveats aside, we found several excellent printers to take along on your road show.



BEST PERFORMANCE

MobileWriterPS
Mannesman Tally
Price: $999

P.O. Box 97018
Kent, WA 98064-9718
(800) 843-1347
(206) 251-5524

Includes: *35 PostScript fonts, a full 6-page-per-minute print speed, 300-dot-per-inch output. Weighs 8.3 pounds—and costs less than $1,000.*

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BEST PERFORMANCE Output quality among all the printers reviewed is acceptable, but four printers, HP's Portable DeskJet, Kodak's Diconix 701, and the two offerings from Mannesmann Tally, create documents that look top-notch. Along with superior output quality, the Mannesmann Tally MobileWriters also offer some exceptional features—they're actual page printers, processing each page in their good-size memories (the MobileWriter has 1MB of RAM, while the MobileWriterPS PostScript printer provides 2MB) and producing them at the laserlike rate of 6 pages per minute. The resulting 300-dot-per-inch output is almost laser quality as well. In addition, these printers give you more fonts to choose from than the other printers we review do—you get 14 fonts with the MobileWriter (which emulates the HP LaserJet Series II) and 35 PostScript fonts with the MobileWriterPS. PostScript quality combined with fast print speed make the MobileWriterPS the best-performing portable printer you can buy.

In order to take full advantage of the MobileWriters, you'll need special paper—they do print to plain paper, but the output is of lesser quality. On the other hand, good-looking 300-dpi output from HP and Kodak is available on plain paper. The DeskJet Portable produces darker text than the Diconix 701's—which printer you prefer is a matter of taste, as is which printer's drawback you could better live with. Like output from the Brother, Canon, Star, and IBM ink jet printers, the HP's has some fuzziness, particularly on italicized text (though surpris-

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Conon's bubble jet printer revalutianized printing fram the raad: Simply hook a PC ta it for instant 300-dot-per-inch autput. Just released is the NoteJet 486—which supplies the PC.

A 7.7-paund notebaak pawered by a 25MHz 486SLC CPU, the $2,499 NateJet comes with a 360-dpi bubble jet printer built in. Feed up ta ten sheets af paper into the back of the unit, and printed pages emerge fram under the keyboard. With a print speed af 2 pages per minute, it's nat ideal far praducing technical manuals, but for mast raad-bound print jabs, it's fine.

The natebaak comes with 4MB of RAM; a 9.5-inch manachrame display; an 85MB, 135MB, ar 180MB hard drive; and twa PCMCIA Type II slats. Heavy printing daesn't leave yau much battery chorge for computing, but if yaur business needs are inextricably tied ta printing, the NateJet is a lightweight salutian. Contact Conan Computer Systems at 123 Paularino Ave., P.O. Box 5048, Costo Mesa, CA 92628-5048 (800-848-4123).



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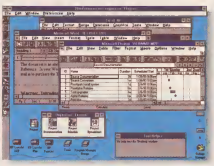




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ingly, it still looks better than the 360-dpi output of that foursome); the Kodak leaves some noticeable ink lines through some text.

Unfortunately, none of the quartet is particularly strong when it comes to portability. Weighing in at 4.4 pounds (all weights include the battery) and priced at $479 (plus $49 for the rechargeable nickel-cadmium battery), the HP Portable DeskJet offers the best quality for the lowest weight of the group. The drawback is that it handles paper one sheet at a time until you add the optional $99 sheet feeder, which holds up to 50 sheets and brings the total weight to 7.5 pounds. If you need to print only an occasional page, this printer without the feeder is an easy choice, but you may not want to lug a printer around at all unless you're going to print frequently.

The other top candidates in this category, because of their heft, are better suited for jaunts from your office to meetings with local customers than for cross-country treks. Indeed, Kodak markets the Diconix 701, which weighs a sizable 5.9 pounds with the built-in 30-sheet feeder, as a "mobile" printer that you can use on your desktop when you're not carrying it to other locations. However, the $479 Diconix 701 (add $49.95 for the rechargeable nickel-cadmium battery) is the most economical choice among these heavyweights.

At 8.3 pounds, the heaviest of all the printers we reviewed, the two Mannesmann Tally MobileWriters are positively bricklike. The MobileWriter costs $875 and the MobileWriterPS $999, and you must factor in the cost for the special paper needed to produce that near-laser quality.

BEST VALUE Honors in this category go to four printers that use a similar print technology: the Citizen PN48 Notebook Printer, the IBM Portable Printer, and the two Mannesmann Tallys. But the Citizen printer and its IBM clone otherwise bear little resemblance to the two MobileWriters from Mannesmann Tally.



A tiny 2.5-pound size makes the Citizen printer the top choice for users who want the ultimate in portability. Another bright spot is its good 360-dpi print quality. And while both the Citizen PN48 and the IBM Portable Printer can handle only one sheet of paper at a time through either a front or bottom slot and offer no optional-sheet feeding equipment, they can handle envelopes, unlike all the other portables.



The Citizen's Roman and Courier fonts and Epson LQ-850 and IBM Proprinter X24E emulations are standard fare among portable printers, and its 1-page-per-minute speed is poky but in line with that of all the printers reviewed except the Mannesmann Tally MobileWriters. The strength of the Citizen's nickel-cadmium battery, which prints up to 25 pages per charge, is slightly below average. But the battery does go into sleep mode if the printer goes a minute without receiving data, and it automatically shuts down when there's no data after 3 minutes—power-saving features not all portable printers have. Recharging takes only 2 hours

PORTABLE PRINTERS: FEATURES AND RATINGS

Many technologies, many prices, but they all fit in a briefcase.

	Brother HJ-100i Brother Int'l Corp. (908) 356-8880	Canon BJ-10ex Canon Computer Systems (800) 848-4123	Citizen PN48 Citizen America Corp. (310) 453-0614	HP DeskJet Portable Hewlett-Packard (800) 752-0900	IBM 4070IJ Lexmark Int'l (800) 438-2468	IBM Portable Printer Lexmark Int'l (800) 438-2468
Price/price as tested	$499/$549	$349/$349	$469/$549	$479/$528	$449/$508	$449/$449
FEATURES						
Print technology	Ink jet	Ink jet	Thermal fusion	Ink jet	Ink jet	Thermal fusion
Paper type	Standard	Standard	Standard	Standard	Standard	Standard
Speed	1.5 ppm	1.5 ppm	1 ppm	3 ppm	1.5 ppm	1 ppm
Resolution	360 dpi	360 dpi	360 dpi	300 dpi	360 dpi	360 dpi
Resident typefaces	Courier, Prestige Elite, Roman, Sans Serif, Draft	Courier, Prestige Elite, Roman, Sans Serif, Draft	Courier, Roman	Courier, CG Times, Univers, Letter Gothic	Courier, Prestige, Roman, Script, Orator, Orator-S, Sans Serif, Draft	Courier, Roman
PORTABILITY						
Size (in inches)	1.9 x 12.2 x 8.5	1.9 x 12.2 x 8.5	2.2 x 11.7 x 3.5	2.5 x 12 x 5.8	2.1 x 12.4 x 8.7	2 x 11.6 x 3.5
Weight	4.6 pounds	4.6 pounds	2.5 pounds	4.4 pounds	4.6 pounds	2.5 pounds
Battery life	30 to 40 pages	30 to 40 pages	25 pages	100 pages	30 to 40 pages	25 pages
SUMMARY						
Pros	Produces good-looking documents; size and weight OK	Average print quality and size; low price.	Most portable of all; good output quality; prints envelopes.	Best-quality output for lowest weight; stylish design.	Produces good-looking documents; size and weight OK; prints envelopes.	Tiny size; good output quality.
Cons	Needs 1.8-pound sheet feeder to print more than one sheet at a time.	Cannot print more than one sheet at a time without sheet feeder.	Can handle only one sheet of paper at a time.	Without optional sheet feeder, can handle only one sheet of paper at a time.	Can print only one sheet of paper at a time without sheet feeder.	Can handle only one sheet of paper at a time.
Verdict	Solid, unspectacular portable printer.	Solid and affordable, if unspectacular.	Best choice for frequent travelers. BEST VALUE	Well-made printer best suited for the desktop or short trips.	Solid printer with not especially noteworthy features.	Best choice for frequent travelers.

when the battery's charge level is at 20 percent, a status that's reported by an alarm and the appearance of an *L* in the LED panel. (Recharge time increases dramatically to 6 hours when the battery is completely drained.)

On the other end of the scale, literally, are the Mannesmann Tally MobileWriters. In addition to near-laser output quality, speedy 6-ppm performance, and numerous font choices, the MobileWriters boast a nickel-cadmium battery that can produce up to 150 pages before needing a recharge—that's more juice than any of the other contenders. (The trade-off is a relatively long recharge time of 8 hours with the printer on; it takes 20 hours if the printer is turned off.) These printers automatically shut down after half an hour of inactivity, and warning lights flash when the battery is low or the thermal transfer ribbon needs replacing. The MobileWriters each come with a built in 80-sheet feeder and feature a control-panel button that allows multiple copies to be made of the last page printed. The

	Kodak Diconix 701 Eastman Kodak (800) 344-0006	Mannesmann Tally MobileWriter Mannesmann Tally Corp. (800) 843-1347	Mannesmann Tally MobileWriterPS Mannesmann Tally Corp. (800) 843-1347	Seikosha LT-20XL Seikosha America (800) 338-2409	Star/Jet SJ-48 Star Micronics America (800) 447-4700
	$479/$529	$875/$875	$999/$999	$499/$549	$329/$379
	Ink jet	Thermal transfer	Thermal transfer	24-pin dot matrix	Ink jet
	Standard	Optimized laser	Optimized laser	Stand., multiport	Standard
	2-3 ppm	6 ppm	6 ppm	1 ppm	1.5 ppm
	300 dpi	300 dpi	300 dpi	360 dpi	360 dpi
	Courier, Helvta, Gothic	Courier, Swiss, Dutch, Lineprinter, Math8	35 PostScript fonts; and Courier, Swiss, Dutch, Lineprinter, Math8	Courier	Roman, H-Gothic
	2.4 x 11.7 x 7.7	11.4 x 2.3 x 8.7	11.4 x 2.3 x 8.7	14.6 x 2 x 11.3	1.9 x 12.2 x 8.5
	5.9 pounds	8.3 pounds	8.3 pounds	6.5 pounds	4.6 pounds
	100 pages	150 pages	150 pages	45 pages	30 to 40 pages
	Excellent business-quality output; built-in paper tray; 3-year warranty.	Laserlike in speed and print quality.	Fast, high-quality output; PostScript fonts.	Only portable printer that handles multipart forms; built-in paper tray.	Print quality and size OK; comes with useful extras.
	5.9-pound weight makes it ill suited for frequent travelers.	Bricklike weight; requires special paper.	Heavy; requires special paper like the MobileWriter.	Only one font; noisy.	Requires 1.8-pound sheet feeder to print more than one sheet at a time.
	Great choice for toting from office to home or local client sites.	If you can handle the weight, this is a superb printer.	PostScript quality and a fast print speed make this the top performer.	This is your only choice if you have to print forms.	Best value among the identical Brother, Canon, and IBM.
			BEST PERFORMER		BEST PRICE

PostScript MobileWriter also includes an AppleTalk port, and, through a dip switch setting, its parallel port can automatically switch emulations between PCL and PostScript data streams.

As noted, the MobileWriters' 8.3-pound weight stretches the definition of *portable printer,* and the specialty paper means a higher consumables cost. Still, no other portable printer comes as close to mimicking a desktop-quality printer. If you can live with the weight and don't mind keeping a supply of laser-optimized paper on hand, either of the MobileWriters provides a wonderful combination of quality and performance.

Two printers earn special mention in this category. If you need to print multipart forms on the road, look to the ruggedly constructed Seikosha LT-20XL. This 6.5-pound 24-pin dot matrix printer also conveniently integrates a 50-sheet paper tray into its pizza-box design. And if for some reason you want the best-looking printer, the HP DeskJet Portable wins easily. Its black case fronted with funky round gray control buttons is attractive by itself, but it becomes even more so when combined with the optional sheet feeder, which also acts as a stand for the Portable DeskJet. The printer fits into the feeder and then tilts at a 45-degree angle to print; and the resulting setup looks surprisingly smart on the desktop.

BEST PRICE The portable printer offering the best deal to date is Star Micronics' StarJet SJ-48, which recently dropped its price to $329, or $369 if you buy it with the automatic sheet feeder. The battery costs an additional $50, but this brings the printer's price to only $379, or $419 with the paper feeder, substantially less than any of the other printers' cost.

Of course, these prices are list, and with discounting, the gap between the Star and several other printers is bound to narrow, especially when there's a popular Hewlett-Packard product in the crowd. Still, the Star stands out because it's the least expensive in a group of virtually identical printers. These 360-dpi ink jet printers (including those from Brother, Canon, and IBM) aren't real attention grabbers. They've been available for a few years and come with features that aren't particularly noteworthy—1.5-page-per-minute speed, half a dozen font choices, single-sheet paper handling, and a nickel-cadmium battery that churns out 30 to 40 pages per charge. But they are quite affordable, and at 4.6 pounds, easy enough to take along on a trip.

At its low price, Star adds some interesting extras to the solid if unspectacular package. First, it can print in a quarter-size mode that allows a spreadsheet to print on one page if you activate a dip switch setting. The similar printers don't have this option. The StarJet also comes with a disk containing a driver for Windows 3.1 and 15 TrueType fonts, as well as two disks with utilities and 13 scalable Bitstream fonts. And it's backed by two-year warranty, which is second only to the Kodak Diconix 701's three-year deal.

Its features may not be earthshaking, but the StarJet and its bargain price are worth checking out, especially if you don't need the ultimate in output quality, features, or portability. At the very least, use the StarJet's price as a guide when you shop around for a portable printer.



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Standard RAM	1MB/0WS	1 Cache	1-2MB	1-2MB	2-16MB
Windows Accelerator		Yes/1MB	Yes/1MB	Yes/1MB	Yes/1MB
1.44MB FDD	•	•	•	•	•
1.2MB FDD			•	•	•
32-bit VESA Local Bus Slots		Yes/2	Yes	Yes/2	Yes/2
14" 1024x768 Monitor	•	•	•	•	•
Mini Desktop Case	•	•	•	•	•
RAM Expandable to 32MB	•	•	•	•	•
16-bit ISA Slots	•	•	•	•	•
101-Key Keyboard	•	•	•	•	•
2-Button Mouse	•	•	•	•	•
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Circle 203 on reader service card.

PCMCIA Redefines Mobile Computing

Finally, your notebook PC has expansion slots—and a full complement of high-performance peripherals.

BY EARLE J. ROBINSON

Although its name doesn't exactly roll off the tongue, PCMCIA is changing mobile computing more dramatically than any technology today. And after years of unfulfilled expectations, we finally have the products to prove it.

Developed in 1989 by the Personal Computer Memory Card International Association, a consortium of more than 300 manufacturers that includes Apple, IBM, and Toshiba, PCMCIA is a completely open, nonproprietary bus standard that does for notebooks, subnotebooks, and palmtops what the ISA bus did for desktop PCs. The compatibility PCMCIA promises—though hardly perfect yet—will allow you to plug any manufacturer's PCMCIA peripheral into your notebook.

We've all seen credit-card-size PCMCIA peripherals (about 2.1 by 3.4 inches), most typically as memory cards or modems. But the full I/O capability supported by the standard also allows mechanical devices such as tiny IDE hard drives to use the slots. PCMCIA LAN cards are already making inroads into traditional notebook docking stations. A host of peripherals, including sound cards, SCSI and CD-ROM controllers, and tape backup drives, looms on the horizon. Wireless modems are already here, and wireless LAN connectors are slowly emerging as well.

Unfortunately, you can expect to pay a hefty premium for these devices: roughly double that of their full-size ISA counterparts. The prices won't remain high, however. As more peripherals begin to reach the market, resulting competition will pull prices earthward. By 1995, for example, modem prices will be within $50 of what you'd pay for an ISA-bus peripheral, according to AP Research.

To find out how compatible, powerful, and easy to use current PCMCIA peripherals really are, we looked at representative PCMCIA products in each of three categories—modems, LAN adapters, and hard drives—and tested them on a Dell 320SLi, an NCR 3170, and a Toshiba T4500. And to give you an idea of the scope of available PCMCIA peripherals, we compiled resource directories listing specs and prices on PCMCIA modems, LAN cards, and hard drives that you can buy today.

Yes, the standard does have some rough edges—there's a haze of types and version numbers—and, yes, universal compatibility remains a goal, not a reality. Still, if you're in the market for a notebook today, you'd be foolish to consider anything without at least one Type II PCMCIA slot, preferably two. When compatibility issues get ironed out and prices start to fall, you'll be

The PCMCIA Payoff

- Universal notebook upgrade
- Easy installation and configuration
- High prices will drop with competition
- Will soon be interchangeable with desktop slots



able to choose from among a flood of high-performance, plug-and-play peripherals that could be interchangeable with a PCMCIA-slot-equipped desktop PC. Look for our full review of PCMCIA-equipped notebooks and peripherals in an upcoming issue.

PLUG AND PLAY? The key to PCMCIA's success is its auto-configurability. Instead of fiddling with DIP switches and configuration programs, you merely pop a peripheral into a slot. The host system automatically recognizes it, which it confirms with a single beep. At least that's what the specification is designed to do. The cards we tested required some installation and running of software. These problems, combined with the confusing array of substandards within PCMCIA, explain why the standard has been slow to win widespread acceptance.

FOUR FLAVORS There are three, soon to be four, types of PCMCIA slots, each identified by the thickness of the card that fits in it. Type I slots, which are 3.3 millimeters thick, accommodate memory cards only. Type II slots, which are backward compatible, hold cards that are 5mm thick (but otherwise maintain the same form factor as Type I cards) and support full I/O capabilities. Older cards can be used in slots that are thicker, because the guides that seat the cards remain the same thickness. Only the center portion of the slot is higher.

Last autumn, Type III slots emerged. Measuring a full 10.5mm thick, they're designed primarily for removable hard drives. Type III is also backward compatible. Type IV slots, which will debut in notebook computers by year end, will accept even thicker hard drives, though the exact size hasn't yet been settled.

Most notebooks—even those now coming to market, such as the IBM ThinkPad 720C—offer only Type II PCMCIA slots. If you plan to install a PCMCIA hard drive in your notebook, your purchase may have to wait until more Type III slots are available. Several manufacturers, including IBM and Hewlett-Packard, also plan to provide PCMCIA slots in desktop computers, a development that will make peripherals interchangeable between portable and deskbound machines.

There are also two versions of the standard itself. Release 1.0, published in 1991, was for memory storage devices, such as those found on the Poqet PC and Hewlett-Packard's HP 95LX. With Release 2.0, announced in 1992, PCMCIA slots got full I/O capability, which enabled them to accept modems, fax modems, and LAN adapters. Release 2.0 also permits the cards to derive power directly from the socket and provides for an execute-in-place (XIP) layer, which permits the system to execute a file directly from the card instead of loading it into RAM first.

Meanwhile, Intel has added an extension to the PCMCIA specification, Exchangeable Card Architecture (ExCA), to ensure that PCMCIA cards are interchangeable on systems using Intel CPUs. As more card makers work with system manufacturers, incompatibilities will be ironed out. Systems that have already earned reputations for compatibility with a wide range of PCMCIA cards include the Dell 320SLi, the NCR 3170, and the Toshiba T4500. Unfortunately, we were often forced to reboot after swapping cards in order for our system to recognize the new card.

SIZING UP A PCMCIA SLOT

As PCMCIA has developed, so have the types of slots.

PCMCIA cards take up less than 2 cubic inches of notebook chassis space. The three, soon to be four, types of cards essentially describe the card's thickness. All types are backward compatible.



Type I cards, measuring 3.3mm in thickness, are used as RAM, flash memory, EEPROM, and one-time programmable memory primarily in personal digital assistants and hand-held devices.

Type II cards are 5mm high and are fully I/O capable. You can use them for modems and LAN adapters as well as for memory.

Type III cards are 10.5mm thick (almost one-half inch) and typically house miniature removable hard drives.

Type IV, not yet ratified by the PCMCIA consortium, will be 18mm high and will be used for large-capacity hard drives.



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Vol.9, #6, September 1992

Advanced Word Processors for Windows	
	Overall Evaluation
1ST Ami Pro 3.0 for Windows	**8.7**
2ND Word for Windows 2.0	8.1
3RD WordPerfect 5.1 for Windows	6.1

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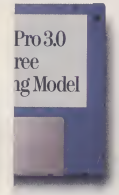
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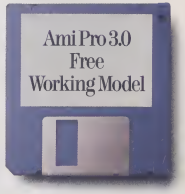
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Protocols: V.42, V.42bis, MNP 5
Format: Type II
Price: $349

C9624RX
E-Tech Research
(800) 328-5538, (408) 730-1388
Speed: 2,400/9,600, 4,800 bps (fax)
Protocols: V.22bis
Format: Type II
Price: $299

Fury Card 14.4
Dr. Neuhaus Mikroelectronik (MicroGraf)
(714) 557-8305
Speed: 14,400 bps (data and fax)
Protocols: V.32, V.32bis, V.42, V.42bis, MNP 2-5
Format: Type II
Price: $489

Fury Card 2400
Dr. Neuhaus Mikroelectronik (MicroGraf)
(714) 557-8305
Speed: 2,400 bps (data and fax)
Protocols: V.42, V.42bis, MNP 5
Format: Type II
Price: $349

ThinFax 9624 Modem
EXP Computer
(516) 496-37503
Speed: 2,400/9,600 bps (fax)
Protocols: V.42, V.42bis, MNP 5
Format: Type I
Price: $369

Fax/Modem 332496
MagicRAM
(213) 413-9999
Speed: 2,400/9,600, 4,800 bps (fax)
Protocols: V.42, V.42bis, MNP 5
Format: Type II
Price: $395

PCMCIA Data/Fax 1144
Megahertz
(800) 527-8677, (801) 272-6000
Speed: 14,400 bps (data and fax)
Protocols: V.32, V.32bis, V.42 ,V.42bis, MNP 5
Format: Type II
Price: $599



AT&T Paradyne and Megahertz PCMCIA modems

FM144/144V (P)
GVC Technologies
(800) 289-4821, (201) 579-3630
Speed: 14,400 bps (data and fax)
Protocols: V.32, V.32bis, V.42, V.42bis, MNP 5
Format: Type II
Price: $499

FM9648/24 (P)
GVC Technologies
(800) 289-4821, (201) 579-3630
Speed: 2,400/9,600, 4,800 bps (fax)
Protocols: V.42, V.42bis, MNP 5
Format: Type II
Price: $269

Optima 24 Plus Fax96
Hayes Microcamputer
(404) 441-1617
Speed: 2,400/9,600 bps (fax)
Protocols: V.42, V.42bis, MNP 5
Format: Type II
Price: $399

SatisFaxtion MobileCard 96/24
Intel
(800) 628-8686
Speed: 2,400/9,600 bps (fax)
Protocols: V.22bis, V.42bis, MNP 5
Format: Type II
Price: $360

PCMCIA Data/Fax 2400/9600
Megahertz
(800) 527-8677, (801) 272-6000
Speed: 2,400/9,600 (fax)
Protocols: V.42, V.42bis, MNP 5
Format: Type II
Price: $379

PalmModem
New Media Corp.
(800) 227-3748, (714) 453-0100
Speed: 2,400/4,800 bps (fax)
Protocols V.22bis
Format: Type I
Price: $259

Infa Blitz
New Media Corp.
(800) 227-3748, (714) 453-0100
Speed: 9,600/9,600 bps (fax)
Protocols: V.42, V.42bis, MNP 5, 10
Format: Type I
Price: $299

Impala 24/96 PCMCIA
Omron Office Automation Products
(800) 362-4411, (408) 727-1444
Speed: 2,400/9,600 bps (fax)
Protocols: V.42, MNP 5
Format: Type II
Price: $399

HOW PCMCIA WORKS The PCMCIA specification uses a 68-pin connector, with power and ground pins that are longer and therefore accessed first. The basic software interface, called Socket Services, uses a set of function calls that work at the same level as the system's CMOS. This gives hardware-independent access, as if the interface were the BIOS of the computer. Though the specification for Socket Services was defined to be part of the computer's BIOS, many system manufacturers implement it as a device driver. Manufacturers who take this shortcut risk making their machines incompatible with many PCMCIA cards.

The programming interface for PCMCIA, called Card Services, provides the calls to link Socket Services to the operating system and applications. Card Services can be implemented either in the operating system, as IBM did for its version of DOS 6.0, or as a driver. Each card must identify itself to the host system, providing it with relevant information about how the card functions.

A PAIR OF MODEMS By far, modems make up the widest selection of PCMCIA peripherals today. We examined two: the AT&T Paradyne KeepInTouch Card ($599) and the Megahertz PCMCIA 2.0 Data/Fax Modem with XJack ($379). Both modems provide 14,400-bps fax and data transmission speeds.

With the AT&T modem, we were able to get throughputs of 3,400 to 3,500 characters per second with plain text files in notebooks that support high port speed. This compares favorably with the high speeds you'll get from standalone or card-mounted modems on desktop systems. Much of the AT&T's outstanding performance was due to the modem's built-in 16550 UART chip. Add to this its cellular capability, and you get an exemplary PCMCIA peripheral.

RESOURCE DIRECTORY: LAN ADAPTERS

Forget notebook docking stations—tie in easily with a PCMCIA LAN card.

AMI LAN PCMCIA
American Megatrends
(800) 828-9264, (404) 263-8181
Network/speed: Ethernet/10 Mbps
Media: Thin Coax, UTP
Format: Type II
Price: $235

StarLAN Ethernet LAN Card
AMT Industries
(714) 375-0306
Network/speed: Ethernet/10 Mbps
Media: UTP Int'l
Format: Type II
Price: unavailable

ENET-MCIA TP
Compex
(714) 630-7302
Network/speed: Ethernet/10 Mbps
Media: Thin Coax, UTP
Format: Type II
Price: $319

PCMCIA Adapter DE-650C
D-Link Systems
(800) 326-1688, (714) 455-1688
Network/speed: Ethernet/10 Mbps
Media: Thin Coax
Format: Type II
Price: $375

PCMCIA Adapter DE-650T
D-Link Systems
(800) 326-1688, (714) 455-1688
Network/speed: Ethernet/10 Mbps
Media: UTP
Format: Type II
Price: $375

Ethernet NetCard
DataTrek
(219) 522-8000
Network/speed: Ethernet/10 Mbps
Media: 10Base2
Format: Type II
Price: $345

G/LapCard Adapter
Gateway Communications
(800) 367-6555, (714) 553-1555
Network/speed: Ethernet/276 Kbps
Media: 10Base T, UTP
Format: Type I
Price: $445

Taken-Ring 16/4 Credit Card
IBM
(800) 426-3333, (914) 765-1900
Network/speed: Token Ring/16 Mbps
Media: UTP, STP/4
Farmat: Type II
Price: $595

Ethernet Credit Card Adapter
IBM
(800) 426-3333, (914) 765-1900
Network/speed: Ethernet/10 Mbps
Media: Thin Coax, UTP
Farmat: Type II
Price: $280

Ethernet Adapter
MagicRAM
(213) 413-9999
Network/speed: Ethernet/ n/a
Media: UTP, Thin Coax
Format: Type II
Price: UTP, $349; Thin Coax, $369

Taken-Ring Adapter
MagicRAM
(213) 413-9999
Network/speed: Token-Ring/4, 16 Mbps
Media: UTP, Thin Coax
Farmat: Type II
Price: $775

10BaseT Ethernet LAN Card
New Media Corp.
(800) 227-3748, (714) 453-0100
Network/speed: Ethernet/600 Kbps
Media: UTP
Format: Type I
Price: $249

10Base2 Ethernet LAN Card
New Media Corp.
(800) 227-3748, (714) 453-0100
Network/speed: Ethernet/600 Kbps
Media: Thin Coax
Format: Type II
Price: $329



Socket Communications LAN card.

RangeLAN/PCMCIA
Proxim
(800) 229-1630, (415) 960-1630
Network/speed: Ethernet/242 Kbps
Media: Wireless radio
Format: Type II
Price: $595

Sacket EA+
Socket Communications
(800) 552-3300, (510) 670-0300
Network/speed: Ethernet/10 Mbps
Media: Thin Coax, UTP, STP
Farmat: Type II
Price: $420

Socket EA
Socket Communications
(800) 552-3300, (510) 670-0300
Network/speed: Ethernet/10 Mbps
Media: UTP, STP
Format: Type II
Price: $399

TC-Card Taken-Ring Adapter
Thomas-Conrad Corp.
(800) 332-8683, (512) 836-1935
Network/speed: Token Ring/4, 16 Mbps
Media: STP
Farmat: Type II
Price: $779

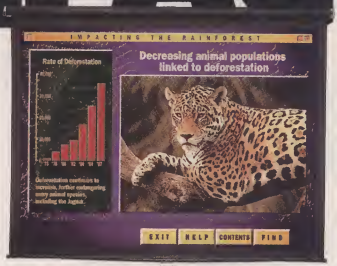
10BaseT TC-Card Ethernet
Thomas-Conrad Corp.
(800) 332-8683, (512) 836-1935
Network/speed: Ethernet/10 Mbps
Media: UTP
Farmat: Type II
Price: $359

10Base2 TC-Card Ethernet
Thomas-Conrad Corp.
(800) 332-8683, (512) 836-1935
Network/speed: Ethernet/10 Mbps
Media: Thin Coax
Farmat: Type II
Price: $375

CreditCard Ethernet CE-10B2
Xircam
(800) 438-4526, (818) 438-4526
Network/speed: Ethernet/10 Mbps
Media: Thin Coax
Format: Type I
Price: $349

CreditCard Ethernet CE-10BC
Xircam
(800) 438-4526, (818) 438-4526
Network/speed: Ethernet/10 Mbps
Media: UTP, Thin Coax
Farmat: Type I
Price: $399

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Circle 164 on reader service card.

GOOD NEWS FOR THE POWER HUNGRY.

YOU HAVEN'T SEEN ANYTHING THIS SMALL AND THIS POWERFUL SINCE that FRENCH GUY.

Some two hundred years after a little guy with a big attitude conquered most of the civilized world, Compudyne offers computing power no one can beat in the lightest notebook package on the market. Without charging a king's ransom.

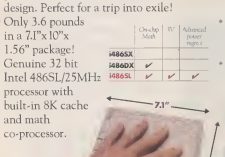
And we're backed by the biggest army in computer retailing, CompUSA®, the Computer SuperStore. That means big-brand security, from the company that started a revolution by offering the latest technology with the best service at the lowest prices.

THE MOST POWER EVER IN A PACKAGE this SMALL.

The tiny and powerful Compudyne Subnote is based on the Intel 486SL/25, which takes Intel's 486 DX technology and adds advanced SL power management in a 3.3 volt implementation. Full DX power in a space-saving, power-saving design. Perfect for a trip into exile!

- Only 3.6 pounds in a 7.1"x 10"x 1.56" package!
- Genuine 32 bit Intel 486SL/25MHz processor with built-in 8K cache and math co-processor.

	On-chip Math	TV	Advanced power mgmt.
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i486DX	✔		
i486SL	✔	✔	✔



UNPRECEDENTED POWER IN THE PALM OF YOUR HAND: COMPUDYNE'S SUBNOTE HAS THE FASTEST PROCESSOR AVAILABLE IN A SUBNOTEBOOK, AND A PCMCIA SLOT TO EXPAND YOUR COMPUTING POWER.

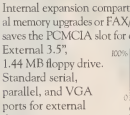


EMPEROR NAPOLEON OF FRANCE (1769-1821): SMALL AND LIGHTWEIGHT, BUT DIDN'T COME WITH WINDOWS.™

- 80 MB removable hard drive, for upgradability, portability, and security.
- PCMCIA Type II slot to add memory, software, and peripherals such as a LAN adapter or a high-speed fax modem.
- Built-in 640 x 480 VGA backlit LCD screen with 64 shades of gray and an ultrabright 18 to 1 contrast ratio.

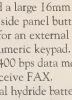
FEATURES	COMPUDYNE Subnote	DELL 320SL	ZEOS Contessa	ZEOS Z-Lite	GATEWAY Hornbook
CPU	i486SL	i386SL	i386SL	i386SL	C&T286
Weight (lbs.)	3.6	4.9	5	4.9	5.25
Removable Hard Drive	Yes	No	No	No	No
RAM standard/ max.	4/20	4/20	4/20	4/8	2/8
PCMCIA Type II Slot	Yes	Yes	No	Yes	No
Backlit Wide Display	Yes	Yes	Yes	Yes	Yes
Battery Life	4	3	3	3.5	4
Integrated Trackball	Yes	No	Yes	No	No
Full-size, Full-Travel Keyboard	Yes	Yes	No	Yes	No
DOS/Windows Diagnostics	Yes	Yes	Yes	Yes	Yes
Price	$1999	$1799	$1795	$1899	$1295

- Internal expansion compartment for optional memory upgrades or FAX/data modem saves the PCMCIA slot for other uses.
- External 3.5", 1.44 MB floppy drive.
- Standard serial, parallel, and VGA ports for external device support.
- Full-size, full-travel 79 key keyboard with inverted-T cursor control, editing and function keys, a numeric keypad, and a large 16mm trackball with easy-to-use side panel buttons.
- PS/2™ port for an external PS/2 keyboard, mouse or numeric keypad.
- Optional 2400 bps data modem with 9600 bps send/receive FAX.
- Nickel metal hydride battery pack, and optional AA alkaline battery pack adapter for on-the-road emergency power.
- Preloaded with Microsoft® DOS 6.0 and Windows™ 3.1, plus Lotus Organizer® Personal Information Manager.

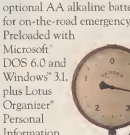


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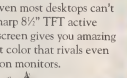
4865L/25 $1,999 $74/mo.



THE MOST COLORFUL, POWERFUL, and the LIGHTEST IN ITS CLASS. COMPUDYNE'S 486DX2/66 ACTIVE TFT COLOR SLIMNOTE.

Compudyne's 486DX2/66 Color Slimnote gives you power even most desktops can't match. And its Sharp 8½" TFT active matrix 256-color screen gives you amazing clarity and vibrant color that rivals even the best workstation monitors.

- Powered by the Intel 486DX2/66, the most powerful processor available in any notebook.
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- Full-size 84 key keyboard with 36 function keys, including dedicated 'Page Up/Down', 'Home' and 'End' keys, for moving around a spreadsheet with military precision.
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- Integrated trackball.
- Internal 3.5", 1.44 MB floppy drive.
- Expansion station connector.
- Combination external keyboard–PS/2 mouse connector.
- Parallel port (doubles as a port for an external 5¼" floppy drive).
- 2 Serial ports (2nd serial port inside unit).
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(USER INSTALLABLE)

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- 2400 bps data modem with MNP-5 & 9600 bps send/receive FAX.

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- External 5.25" 1.2 MB floppy drive.
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- External numeric keypad.
- Auto adapter.
- Standard or leather carrying bag.
- Spare NiMH battery.

intel inside

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Our award-winning monochrome notebooks are the speediest and lightest on the market - with a full 10" VGA screen (640 x 480 res., 64 grayscale, brilliant LCD) and all the great features and options of our Color Slimnote. The 486DX/33 Slimnote supports 800 x 600 external video and has NiCad batteries, while the 486DX2/66 supports 1024 x 768 external video on Nickel metal hydride batteries.

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486SL/25	80 MB HD 4 MB RAM	**$1,999** $74/mo.*
MONOCHROME NOTEBOOKS		
486DX/33	120 MB HD 4 MB RAM	**$2,299** $85/mo.*
486DX2/66	210 MB HD 4 MB RAM	**$2,999** $111/mo.*
COLOR NOTEBOOK		
486DX2/66	210 MB HD 4 MB RAM	**$4,499** $166/mo.*

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*Leasing arranged through Leasing Group, Inc.; payments based on 36 month open-end rate. **Must be returned 'as new' in original packaging. Prices and specifications subject to change without notice. Intel® 486 and the Intel Inside logo are trademarks of the Intel Corp. ©1993 Trademarks belong to their registered owners. On-site service for notebooks optional. Each system will be shipped from the nearest CompUSA SuperStore. Compudyne Direct. 15167 Business Avenue, Dallas, TX 75244.

PCC0732

Circle 165 on reader service card.

RESOURCE DIRECTORY: HARD DRIVES

Minimarvels include mechanical hard drives as small as 3¼ by 2 inches.

Model Au63-P
Aura Associates
(408) 252-2872
Capacity: 63MB
Access times: 17ms
Format: Type III
Price: $399

Model Au126-P
Aura Associates
(408) 252-2872
Capacity: 126MB
Access times: 17ms
Format: Type III
Price: $499

Derringer CP-1044
Conner Peripherals
(800) 426-6637, (408) 456-4500
Capacity: 42MB
Access times: 19ms
Format: Type III
Price: $350

PocketFile 42
Integral Peripherals
(303) 449-8009
Capacity: 42MB
Access times: 18ms
Format: Type III
Price: $495

PocketFile 85
Integral Peripherals
(303) 449-8009
Capacity: 85MB
Access times: 18ms
Format: Type IV
Price: $695

MXL-105-III
Maxtar
(800) 462-9867, (408) 432-1700
Capacity: 105MB
Access times: 18ms
Format: Type III
Price: $499

MiniPort 42P
MiniStor Peripherals
(408) 943-0165
Capacity: 42MB
Access times: 16ms
Format: Type III
Price: $449

MiniPort 64P
MiniStor Peripherals
(408) 943-0165
Capacity: 64MB
Access times: 16ms
Format: Type IV
Price: $489

Caviar UltraLite CU140
Western Digital
(800) 832-4778, (714) 932-4900
Capacity: 42MB
Access times: 19ms
Format: Type III
Price: $299



MiniStor MiniPort

The Megahertz modem was unable to handle port speeds higher than 19,200 bps in any of the three notebooks in which we tested it. This may be because of problems in the Socket Services or Card Services drivers rather than in the modem itself, though the lack of the 16550 UART (and the larger buffers provided by it) may also have slowed it down.

When we transferred files archived with PKzip, we were able to get throughput of 19,200 bps on both the Megahertz and the AT&T modems. This translates to 1,600 to 1,650 cps for such files, which is similar to conventional external modem rates.

Though the Megahertz lacks built-in support for high-speed compressed transfers, it gets high marks for ergonomics. It includes a device called XJack, which is an RJ-11 connector that pops up out of the modem itself. This eliminates the need for external adapters—which on many PCMCIA modems are bulkier than the modem itself. When you're ready to disconnect, push the jack down; it locks into place like the button on a ballpoint pen.

NETWORKS AND STORAGE Notebook PCs present unique networking and storage challenges, precisely because they lack slots. In most cases, upgrading a notebook's hard drive is either impossible or prohibitively expensive. Likewise, communicating with a network via a parallel port connection is an unacceptably slow alternative. Enter PCMCIA, which allows an adapter to work at full bus speeds. We looked at the Socket EA Ethernet LAN card from Socket Communications. It combined an RJ-45 connector and a coaxial connection on a module that was somewhat larger than the card itself.

Performance was superb. In ZD Labs' NetBench test, the card's throughput was nearly three times as fast as Xircom's parallel-port Ethernet adapter. The Socket EA makes clear that the main competition for PCMCIA LAN adapters will be desktop docking stations that use traditional, full-size LAN cards.

The Socket EA connects to 10Base-T; the EA Plus can also attach to 10Base-2 Ethernet. Both products include 64K of multipacket buffer SRAM, their own PCMCIA bus logic, and configuration and diagnostic software. As LAN solutions go, they clearly point to the future.

Miniature PCMCIA hard drives are beginning to appear as well. We evaluated the MiniPort 64P from MiniStor Peripherals. This drive, self-contained on its card and without any extra modules, was somewhat slower than a non-PCMCIA hard disk in our tests. For many users, the performance penalty matters little compared to the auxiliary storage the drive offers—and the fact that it's removable.

IBM, Maxtor, and Conner have announced plans to build 1.8-inch PCMCIA hard drives that will appear in permanent mounts in subnotebooks as well. Though 40MB, 60MB, and 80MB drives should hit the streets in the near future, the greatest interest lies with 105MB drives, given the increasing demand for storage space.

For all its future potential, however, PCMCIA products are available today—despite their compatibility glitches and lofty prices. In an upcoming issue, we'll fully test PCMCIA-equipped notebooks and peripherals. If you're buying a notebook now, you'd be foolish to consider anything without PCMCIA slots. ◩

Earle J. Robinson is a Paris-based computer consultant.

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FEATURES:

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- 1 AVAILABLE EXTERNAL 5.25" HALF-HEIGHT DRIVE BAY
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DELL DIMENSION 486/66
i486 DX2 66MHz SYSTEM

$2,899†

FEATURES:

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- 8MB RAM (EXPANDABLE TO 64MB)
- 450MB (12ms) HARD DRIVE
- 128KB EXTERNAL CACHE
- ***INTERNAL CD ROM***
- ***ACCELERATED LOCAL BUS VIDEO***
- ***1MB VIDEO RAM***
- ULTRASCAN™ 15FS MONITOR (15", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
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- 2 SERIAL PORTS, 1 PARALLEL PORT, 1 MOUSE PORT
- 200-WATT POWER SUPPLY
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†OFFER EXPIRES 7/31/93



DELL DIMENSION 486/66
i486 DX2 66MHz SYSTEM

$3,199†

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DOS

Five Ways to Take Control Of DoubleSpace

MAKE DOS 6.0'S COMPRESSION ENGINE WORK FASTER AND MORE EFFICIENTLY BY SAVING RAM, REFINING COMPRESSION ESTIMATES, AND MORE. **BY JEFF PROSISE**

DOUBLESPACE IS ONE of DOS 6.0's most powerful tools, and with a little fine-tuning it runs even better. Here's how to optimize DoubleSpace so that it takes up a minimum of conventional memory, gives you the greatest amount of hard disk space, and provides more accurate estimates of the amount of disk space remaining. With these five tips, you'll soon have DoubleSpace running smoothly and efficiently.

Don't Waste RAM

The greatest drawback to running DoubleSpace is that its driver, which is automatically loaded at startup, requires approximately 43K of RAM. If you're running DOS 6.0 on a 386 or 486 system, move DoubleSpace into upper memory by adding the following command line to your CONFIG.SYS file:

```
DEVICEHIGH=C:\DOS\DBLSPACE.SYS /MOVE
```

As with other DEVICEHIGH commands, this one must come after the statement that loads EMM386.EXE (or another upper memory block provider), and CONFIG.SYS must include the statement DOS=UMB.

Once you've compressed all the drives you plan to compress, save a few more bytes of RAM: Type DBLSPACE at the DOS prompt, select Tools, Options, and reduce the "Last Drive Reserved for DoubleSpace's Use" setting to the highest drive letter that you actually use. DoubleSpace reserves more drive letters than you need to mount compressed floppies and other removable media later on. Each extra drive letter takes up 88 bytes of conventional RAM, so don't reserve any more drives than you need.

Estimate Free Space Better

DoubleSpace can only estimate the free space remaining on a compressed drive, because compression ratios vary from file to file. To provide a free space estimate, DoubleSpace factors in the actual space and the drive's estimated compression ratio.

After you compress a drive or add several files to a drive that was created from the free space on another drive, select Info from the Drive menu and see if the actual compression ratio and the estimated compression ratio are the same. If they're not, select Change to adjust the estimated compression ratio so that it matches the actual ratio. Do this periodically to make sure the two stay in sync.

To adjust the estimated ratio for all compressed drives every time you boot up, add this line to AUTOEXEC.BAT:

```
DBLSPACE /RATIO /ALL
```

This command sets the estimated compression ratio for each compressed drive to its actual compression ratio.

Enlarge Compressed Drives

By default, DoubleSpace leaves at least 2MB of uncompressed space on the host drive (the uncompressed drive that serves as the "host" for a compressed drive). DOS stores system files in this uncompressed drive, and that's where Windows' permanent swap file belongs, too. If you're not using a Windows permanent swap file, you can add about 3MB to the free space on the compressed drive by reducing the size of the host drive. On the DoubleSpace screen, highlight the compressed drive, select Change Size from the Drive menu, and

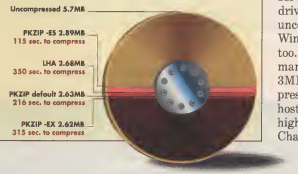
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PKzip

To compress files into archives, use PKzip and LHA. PKzip 2.04G, a $47 shareware program from PKware (9025 N. Deerwood Dr., Brown Deer, WI 53223; 414-354-8699), can compress files more efficiently than any other archiver.

But in terms of bang for the buck, it's hard to beat LHA, a freeware program written by Haruyasu Yoshizaki. Though LHA compresses files less tightly than PKzip does, its one executable file needs only 34K of disk space, while PKzip's three executables take about 100K. Download LHA213.EXE from PC/Contact's data library 3 (Utilities/Misc.) and PK204G.EXE from library 0 (General/Forum Info.).



enter a smaller figure in the New free space box under the uncompressed drive. DoubleSpace will accept values as low as 0.54MB.

Optimize Compressed Drives

Microsoft's choice of the word *Defragment* in the DoubleSpace Tools menu is unfortunate. This command doesn't really defragment a drive; it compacts the Compressed Volume File (CVF), which is the hidden file that contains all the data written to a compressed drive. It does this by moving all the sectors that contain data to the beginning of the CVF while moving free sectors to the end of the file. Sometimes DoubleSpace requires you to "defragment" a compressed drive in this manner before changing its size.

To optimize a compressed drive, use DOS 6.0's DEFRAG command. After defragmenting the files on the drive, DEFRAG invokes DoubleSpace's Defragment command and compacts the CVF. Because of the way that sector space is allocated in a CVF, defragmenting a compressed drive doesn't ensure that all its files are stored in contiguous sectors—but it's still a good idea to run DEFRAG occasionally because it will improve the speed of your compressed drive.

Check File Compression

The Lempel-Ziv algorithm that DoubleSpace uses to compress file data is more adept at compressing some types of files than others. It works well on files that contain repetitive data sequences, such as BMP or PCX graphics files, spreadsheets, and database files. It doesn't work so well on files that contain truly random data, or on files that are already compressed, like some executables. As a result, file-by-file compression ratios vary.

To see how well DoubleSpace is compressing each file, type DIR /C. The /C switch displays the compression ratio of each file listed. To sort directory listings by compression ratio from lowest to highest, type DIR /O:C. To sort from highest to lowest compression ratio, type DIR /O:-C. ◩

/// Hot Tips

Keep File Versions on Two PCs in Sync

Keeping files up-to-date on more than one system is a chore—you have to avoid overwriting new files with older versions. Here's a batch file that uses DOS's REPLACE command to ensure that you've got the latest version of a file, no matter which PC you're using. Enter these lines in a text editor and save the file as UPDATE.BAT:

```
@ECHO OFF
IF NOT EXIST %1\NUL GOTO NOEXIST
IF %1!==! GOTO INFO
ECHO This batch file updates files in the current
ECHO directory with the files in %1.
PAUSE
FOR %%A IN (*.*) DO IF NOT EXIST %1\%%A DEL %%A /P
REPLACE %1\*.* /A
REPLACE %1\*.* /U
GOTO END
:NOEXIST
ECHO Specified directory doesn't exist.
:INFO
ECHO Syntax: UPDATE [target directory]
ECHO For example, UPDATE B: or UPDATE F:\BUDGET
:END
```

To update a floppy disk so that it matches your directory of budget files, for example, switch to drive A:, and enter this command:

```
UPDATE F:\BUDGET
```

This copies files from F:\BUDGET to A: that aren't already on the floppy disk and replaces older versions of the files with the newest versions. If files that don't exist in F:\BUDGET exist on the floppy disk, the batch file prompts you to delete them so that the floppy matches F:\BUDGET file for file.

To transfer the files from the floppy disk to another system—a laptop, for example—switch to the directory where you want to place your files, and enter UPDATE A:. When you're done working, switch back to A: and enter this command to update the files you modified: UPDATE C:\WORK.

Back at your office PC, switch to the F:\BUDGET directory and enter UPDATE A:—the laptop, the floppy, and the office system now have the most recent files.

Note: Since the REPLACE command checks each file's time/date stamp to determine the newest version, synchronize each system with DOS's TIME and DATE commands. Otherwise, you may overwrite new files with older versions.

DYLAN TWENEY

Delete with Confidence—And without TSRs

You don't need a TSR to run a deletion sentry. DOS's batch language provides all you need to intercept the DEL command and copy deleted files to a hidden directory. Enter these lines in a text editor and save the file as SAFEDEL.BAT.

```
@ECHO OFF
IF %1!==! GOTO NOFILE
IF NOT EXIST C:\TRASH\NUL MD C:\TRASH
ATTRIB C:\TRASH +H
COPY %1 C:\TRASH
```

CONTINUED ON PAGE 260

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/// Hot Tips ///

CONTINUED FROM PAGE 259

```
ECHO Y|ERASE %1 > NUL
GOTO END
:NOFILE
ECHO Specify file(s) to be deleted.
:END
```

To run the batch file, enter SAFEDEL at any prompt followed by the names of the files you want to delete. This command deletes all DOC files from BACKUP:

```
SAFEDEL \BACKUP\*.DOC
```

To restore files, simply change directories to TRASH (CD C:\TRASH), and copy the files to their correct places. Occasionally, you'll need to empty your trash can. A second batch file checks the TRASH directory to see if you need to. Enter these lines in a text editor, and save the file as CHECKCAN.BAT:

```
@ECHO OFF
DIR C:\TRASH > C:\TRASH\CAN.TXT
ECHO Trashcan files occupy ... > C:\TRASH\CAN.LST
TYPE C:\TRASH\CAN.TXT |FIND "file(s)" >> C:\TRASH\CAN.LST
ECHO. >> C:\TRASH\CAN.LST
ECHO ... and you have this much free space >> C:\TRASH\CAN.LST
ECHO. >> C:\TRASH\CAN.LST
TYPE C:\TRASH\CAN.TXT |FIND "free" >> C:\TRASH\CAN.LST
TYPE C:\TRASH\CAN.LST
ERASE C:\TRASH\CAN.*
```

Enter CHECKCAN, and the batch file reports the contents of your trash can and the space left on your hard disk.

To make SAFEDEL.BAT easier to use, assign it to a DOSKEY macro called DEL. Add this line after the PATH statement in AUTOEXEC.BAT:

```
DOSKEY DEL=c:\directory\SAFEDEL.BAT $1
```

To empty TRASH or perform a normal deletion, bypass the DOSKEY macro: Precede DEL with a space or use ERASE.

JOHN TASCHEK

Make Your Cursor Stand Out

Locating the cursor on most laptop PC screens is tough on the eyes. Use this program to change your cursor into a block that's easy to see. Enter the following lines in a text editor, and save the file as BIGCURSR.SCR in your utilities subdirectory.

```
N BIGCURSR.COM
E 0100 B4 01 B9 04 01 CD 10 CD
E 0108 20
RCX
0009
W
Q
```

Next, change to the utilities subdirectory and enter

```
DEBUG < BIGCURSR.SCR
```

to create BIGCURSR.COM. Add BIGCURSOR to your AUTOEXEC.BAT before any statement that loads menus. The large cursor works only at the DOS prompt.

MIKE RAMSEY

AN OPEN LETTER TO MICROSOFT

(from the data compression experts at Stac™)

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Dear Microsoft,

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Sincerely,

Your friends at Stac

P.S. Anyone else who's interested can call **1-800-522-STAC, ext. 6307** (or 619-431-7474) for more information about Stacker 3.1 for Windows & DOS and the Stacker Special Edition.

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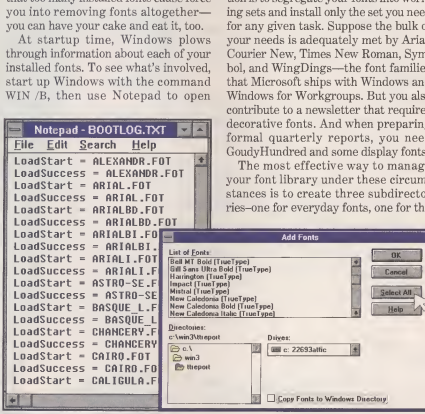
Font Management Makes Windows Faster

YOU DON'T HAVE TO BANISH YOUR FONT LIBRARY TO RESTORE WINDOWS' SPEED. BY CRAIG STINSON

Is WINDOWS TAKING longer to load these days? If so, the culprit may be your font library. Install just one of the many TrueType font packs on the market, and the time Windows takes to get up and running every morning increases by 25 percent or more.

Having too many fonts also causes significant delays when you open your applications' font dialog boxes. And get this: Windows lets you install up to 1,170 TrueType fonts (remember that at your next Windows trivia party). Imagine what it would be like to scroll through a font dialog box with that many entries! But don't let the inevitable slowdown that too many installed fonts cause force you into removing fonts altogether—you can have your cake and eat it, too.

At startup time, Windows plows through information about each of your installed fonts. To see what's involved, start up Windows with the command WIN /B, then use Notepad to open BOOTLOG.TXT. Scroll down until you find the LoadStart and LoadSuccess lines for files with the .FOT extension. Each of these files is half of a pair of files that make up a TrueType font (the other file has the same name but with the extension .TTF). Scroll down your boot log and you'll see how much startup information Windows goes through to give you all those font choices. Now print out the FOT section of BOOTLOG.TXT—you'll need it later on.



The BOOTLOG list (left) shows a fraction of the font list many systems must plow through at startup. To speed things up, install special fonts only when you need them.

Grouped Fonts Are Faster

Don't gut your font library just to get your system back up to speed. The solution is to segregate your fonts into working sets and install only the set you need for any given task. Suppose the bulk of your needs is adequately met by Arial, Courier New, Times New Roman, Symbol, and WingDings—the font families that Microsoft ships with Windows and Windows for Workgroups. But you also contribute to a newsletter that requires decorative fonts. And when preparing formal quarterly reports, you need GoudyHundred and some display fonts.

The most effective way to manage your font library under these circumstances is to create three subdirectories—one for everyday fonts, one for the newsletter, and a third for your reports. To determine which fonts belong in which subdirectory, use Control Panel, Character Map, or a font viewer such as Fonter, this month's Winapp. Draw up a list that allocates fonts to functions (expect some overlap among the three sets), and you'll almost be ready to move the fonts into their subdirectories.

You need to figure out which files belong to which fonts. Refer to your BOOTLOG.TXT listing of FOT files. In many cases, the filename obviously corresponds to a font. ARIAL.FOT, ARIALI.FOT, ARIALBD.FOT, and ARIALBI.FOT, for example, clearly represent Arial, Arial Italic, Arial Bold, and Arial Bold Italic. But you might not recognize that LFAX.FOT is the FOT file for Lucida Fax Regular. Work your way through the list, and if you're stumped by a few names, try this trick: Since a font's full name is always recorded near the beginning of its FOT file, open the FOT file in Notepad. Turn on Notepad's word-wrap option, and look for the name.

Create Working Font Groups

Equipped with the font and file names, you're ready to fire up your favorite file manager and move the appropriate font files into each subdirectory. You don't have to move FOT files—only those with the .TTF extension—because the details about how to form the font's characters are recorded in the TTF file. The FOT file tells Windows where to find the TTF file. When you move files on disk directly, the FOT files no longer point to the TTF files—so you must update your system immediately after moving the files.

Open the Font applet in Control Panel and select all the TrueType fonts.

Winapp of the Month

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Having trouble keeping trock of your font library? Try OsoSoft's Fonter, o $15 shorewore progrom thot disploys and prints your font library. Fonter beots Control Panel and Chorocter Mop hands down for disploying fonts onscreen. It olso enobles you to print fant lists and somples, or even o book of chorocters for eoch font in vorious sizes.

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The quickest way to do this: Click on the first entry in the list. Drag the scroll box to the bottom of the scroll bar, then hold down the Shift key and click the last entry in the list. Then scroll upward through the list; hold down Ctrl and click on any entry that isn't marked TrueType. Then click on the Remove button. In the confirmation dialog box that appears next, make sure there's no *X* in the box labeled Delete Font File From Disk. Then click on Yes to All. Congratulations—you've just taken a huge load off your system.

To install a working set of TrueType fonts, click on the Add button, move to the appropriate subdirectory, and click on Select All. Deselect Copy Fonts to Windows Directory, then click on OK.

When you want to work on a report or newsletter, open Control Panel's Fonts applet again, remove all the TrueType fonts one more time, and install your special project's fonts. That's all there is to it. If you ever begin to resent these two steps added to your monthly ritual, remember how much faster Windows and its apps run with a light font load. You'll wonder how you ever endured the delays.

. . . Or Buy One of These

Creating working font groups is the no-cost, disk-friendly method of keeping your fonts under control. But it's not the only—or the best—way to go. For a few extra dollars, you can automate font management. Of the many font utilities to be found, two stand out from the pack and provide an easy-to-handle front end to font management. One is the Microsoft Font Assistant, which comes at no extra cost when you buy the Microsoft TrueType Font Pack ($69.95; Microsoft Corp.; One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080). This program comes with several predefined font groups based on the Windows 3.1 font library and the font pack of which it's a part.

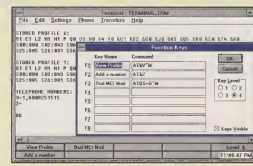
Another handy font utility is Ares Software's FontMinder ($80; Ares Software; P.O. Box 4667, Foster City, CA 94404; 800-783-2737, 415-587-9090). In addition to maintaining a variety of TrueType and PostScript font packs, FontMinder flags PostScript fonts that are resident in your printer or font cartridge so that they aren't downloaded unnecessarily.

Hot Tips

Increase Terminal's Phone Number Roster

Don't let Terminol's limit of one phone number per TRM file cromp your online needs—store frequently used numbers in your modem. Mony modems con store severol numbers in nonvolotile RAM, where they remoin even when the modem is turned off.

To check whether your modem hos this copocity, stort Terminol, type AT&V, ond press Enter. When the screen disploys the modem's stored profile informotion, look for o Telephone Numbers heoding. If the heoding is there, you'll be oble to expond Terminol's phone book by os mony entries os the modem disploys.



Use Terminol's function keys to creote ond use stored phone numbers. Choose Settings, Function Keys, type View Profile in the Key Nome box of ony function key, ond type AT&V^M in its Commond box. Nome onother key Chonge o Number, ond type AT&Z in its Commond box. Ensure thot there's on *X* in the Keys Visible box, ond click on OK.

To odd o telephone number to your modem's internol list, click on the new Chonge o Number button. Type 0= followed by o phone number (including the prefix of the outside line if necessory), ond then press Enter. Click on Check Profile to verify that you've progrommed the number into the modem—it should oppeor on the &Z0= line.

Choose Settings, Function Keys, ond select o blonk function key. Type o nome for the number you just progrommed into the modem, type ATDS=0^M in the key's Commond box, ond click on OK. To diol the number, click on the button you just defined.

To ossign numbers to the modem's other vocont slots, click on Chonge o Number ond type 1= (or onother free slot number) followed by the phone number you wont to ossign to thot slot. Then creote new function keys with the commonds ATDS=1^M, ATDS=2^M, ond ATDS=3^M to diol eoch of the stored phone numbers. To delete o number, click on the Chonge o Number button, ond type the slot number followed by on equol sign, then press Enter.

MATTHEW LAKE

Delete Files Safely in File Manager

DOS's UNDELETE commond doesn't reliobly recover files deleted with File Monoger. To guord ogoinst the risk of occidentolly deleting on importont file, creote o "trosh con" in File Monoger ond use o Recorder mocro to move files there instead of deleting them.

Select the root directory of your hord drive ond choose File, Creote Directory to creote o new subdirectory. Nome it TRASHCAN ond click on OK. Select this new directory ond press Alt-Enter to coll up the Properties diolog box. Put on *X* in the Hidden box to moke TRASHCAN o hidden directory, ond click on OK. Then choose Window, New Window, double-click on the TRASHCAN directory in the new window, ond minimize the window.

To delete o file or group of selected files, simply drog it onto the TRASHCAN icon in File Monoger. If the files or directories you're deleting ore on o different drive, hold down Alt os you drog them into the troshcon—otherwise, they'll be

CONTINUED ON PAGE 268



WHY SETTLE FOR A DOT MATRIX PRINTER WHEN YOU CAN HAVE ALL THIS?

For about the same price as a dot matrix printer, the new TI microMarc gives you the same 300 dpi print resolution as most laser printers. And with its advanced inkjet technology, print quality stays constant for the life of the print cartridge, instead of fading like a dot matrix ribbon. The microMarc is so quiet, reliable, inexpensive to run and easy to use, it can help you do more with your printer than you ever thought possible. At a price you never thought possible. For more information and the dealer nearest you, call *1-800-527-3500*.

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This Month's Free Software and Shareware

All the public-domain and shareware programs, batch files, and utilities featured in *PC/Computing* each month are available on our online service, PC/Contact, or on disk from Public Brand Software for a fee. Shareware requires additional payment to authors for continued use. Here's a sampling of the programs you'll find this month.

Fonter .....Windows, page 262

Having trouble keeping track of your font library? Try OsoSoft's Fonter, a $15 shareware program that displays and prints your font library. Fonter beats Control Panel and Character Map hands down for displaying fonts onscreen. It also enables you to print font lists and samples. Download the file FONTER.ZIP from data library 3 (Utilities/Misc.).

SHIFTKEY .....Q&A, page 294

Do you sometimes want to skip a group of commands during the boot process? It's easy to do if you have Bootcon or MS-DOS 6.0 but not so simple for users of DOS 5.0 or earlier versions. SHIFTKEY is a utility that returns an ERRORLEVEL code equal to 1 or higher if one or both Shift keys are pressed, or 0 if neither Shift key is held down. Use SHIFTKEY in your AUTOEXEC.BAT file to check the status of the Shift key and then branch to another part of the batch file based on whether the Shift key is held down or not. Don't want to use the Shift key? See Q&A for how to modify SHIFTKEY to use the Ctrl or Alt keys instead. To make the boot process as flexible as it can be, download SHFKEY.ZIP from data library 3 (Utilities/Misc.).

Practice navigating CompuServe for free.

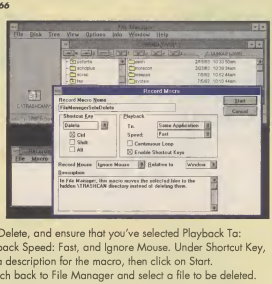
Having trouble with CompuServe's sometimes arcane command structure? Need help downloading a file? Don't spend your connect time fishing around for the right command. Instead, try CompuServe's Practice forum. This forum is free of connect-time charges. You can learn how to download files, send and receive messages, and generally navigate the CompuServe interface—at no cost. If you access CompuServe via Telenet or TymNet, you'll still pay for local access, but your regular CompuServe hourly connect fee is waived in the Practice forum. To get there, type GO CIS:PRACTICE at any CompuServe prompt.

For how to join PC/Contact see page 298.

Hot Tips

CONTINUED FROM PAGE 266

copied instead of moved. If you use the keyboard for file management, make a simple Recarder macro to accomplish the same thing. From File Manager, press Alt-Tab as many times as necessary to switch back to Program Manager. Start Recorder and choose Macro, Record to begin a new macro.



Call it FileManagerSafeDelete, and ensure that you've selected Playback To: Same Application, Playback Speed: Fast, and Ignore Mouse. Under Shortcut Key, select Ctrl-Delete. Type a description for the macro, then click on Start.

Use the mouse to switch back to File Manager and select a file to be deleted. Then press F7 (Move), type C:\TRASHCAN (assuming that your TRASHCAN directory is on drive C:), and press Enter. Then use the mouse to minimize File Manager, and click on the blinking Recorder icon. Select Save Macro and click on OK. Restore the Recorder window and save the file as FILEMAN.REC.

To use the macro, make sure Recorder is running with FILEMAN.REC open. Then simply select the files you want to delete in File Manager and press Ctrl-Del. Recorder takes over and moves the files into the TRASHCAN directory.

Periodically check the contents of the trash can by double-clicking an its icon in File Manager. When it gets full, select files and choose File, Delete to delete them permanently.

DYLAN TWENEY

Clear Out Windows Directories

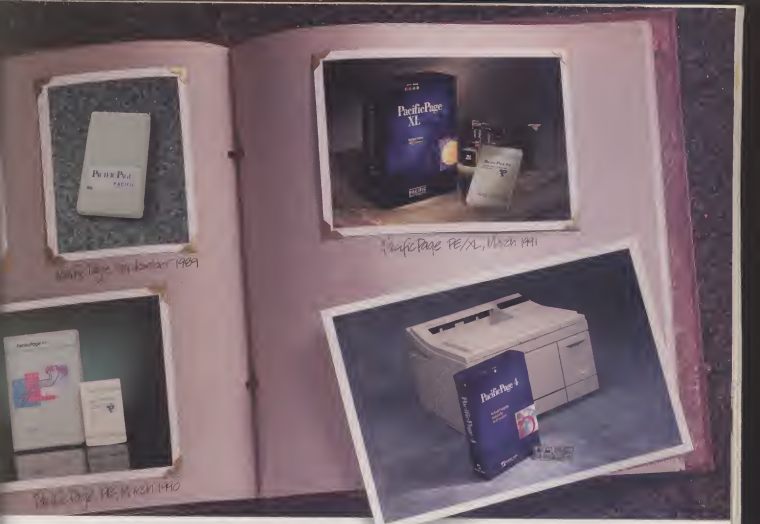
Over time, your two Windows subdirectories—\WINDOWS and \WINDOWS\SYSTEM—become cluttered with hundreds of files, making it difficult to find and back up the important ones. Tidy things up by grouping PIF, TXT, and other supporting files into separate subdirectories.

From File Manager, create a subdirectory under your Windows directory called PIF. While still in the Windows directory, select View, By File Type, type *.PIF, and click on OK. Press Ctrl-slash (Ctrl-/) to select all the PIF files, and drag them into the new PIF directory. Then drag PIFEDIT.EXE and PIFEDIT.HLP from the Windows directory into the PIF subdirectory.

Next, Alt-Tab to Program Manager and locate all your non-Windows applications. For each one that's loaded with a PIF file, press Alt and double-click on its icon to bring up its Properties dialog box. Then change the Command Line box to reflect the PIF file's new location, and click on OK to save changes. Finally, change the settings for the PIF Editor's command line and working directory to reflect the new subdirectory.

Move data files belonging to Calendar and Cardfile into a PIM subdirectory—just move all the CAL and CRD files along with the two applications' executables and help files, then change the appropriate Program Manager icon properties to reflect the new command lines and working directory. Do the same with Terminal and its TRM files, Notepad and TXT files, and Write and WRI files. Even WAV files can have their own subdirectory—which you'll need to specify in Control Panel's Sound module whenever you change system sounds.

MATTHEW LAKE



Introducing PacificPage 4. The latest addition to a very prominent family.

The latest member of the award winning PacificPage® family has arrived. Called PacificPage 4, it's designed just for the new LaserJet® 4 printer.

Like all of its earlier family members, PacificPage 4 provides full PostScript® language emulation. The same 35 Apple® LaserWriter® scalable typestyles. And all of PostScript's powerful graphics capabilities. It also accepts downloaded Type 1 and 3 font formats.

Just install the SIMM module into any of your printer's memory slots. With 4 MB of additional printer memory, PacificPage 4 can print your PostScript output at an impressive 600 dpi resolution. You'll get sharp, crisp output that you'd expect only from an expensive, high-end PostScript device.

And your PostScript files will be printed quickly because PacificPage 4 utilizes the i960™ processor built into each LaserJet 4.

If your printer is on a network, you never have to worry about confusing the printer with PCL and PostScript files.

PostScript language emulation for the LaserJet 4

That's because PacificPage 4 fully supports the automatic language sensing and switching feature of the LaserJet 4.

Like all of the PacificPage products before it, PacificPage 4 is covered by a full lifetime warranty and is backed by a 60-day money back guarantee of satisfaction.

With all of these impressive features and capabilities, you'll be surprised to learn that PacificPage 4 is priced at a low $299. Although, if you're familiar with PacificPage 4's predecessors, you know that high quality and low price run in the family.

For the dealer nearest you or to order PacificPage 4, call (619) 625-3627 Fax (619) 552-0889.

Be sure to ask about Pacific 4 SIMM Memory™ — 1, 2, 4, and 8 MB memory upgrades for the LaserJet 4.

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EXPERT ADVICE TO HELP YOU TAP THE HIDDEN RESOURCES OF POPULAR APPLICATIONS AND UTILITIES

WORD FOR WINDOWS

LIST FILES OF ALL EXTENSIONS

Feel restricted by Word for Windows' insistence on looking for *.DOC files when you select File, Open? Make it look for *.* files instead. Choose Tools, Macro, then enter FileOpen for the macro filename and click on Edit. Enter these lines between the Sub MAIN and End Sub lines to replace the existing text:

```
On Error Goto bye
Dim dlg As FileOpen
GetCurValues dlg
dlg.Name = "*.*"
Dialog dlg
Super FileOpen dlg
bye:
err = 0
```

Highlight the entire listing and copy it to the Clipboard by pressing Ctrl-C. Then select File, Close, and click on Yes to save the changes.

This macro always looks for *.* when you choose File, Open. Here's how to add another menu option to search for specific file extensions. Choose Tools, Macro, enter the name OpenExt in the Macro Name box, and press Enter. Highlight the Sub MAIN and End Sub lines, then press Ctrl-V to paste the contents of the Clipboard (the FileOpen macro) into the macro window. Delete the line dlg.Name = "*.*" and close the macro, saving your changes on the way out.

Add the new macro to your pull-down menus by choosing Tools, Options, and scroll down to Menus. Select &File from the Menu, highlight the OpenExt macro, change the menu text to read Open E&xt, and select Add, Close.

ROBERT BAYLEY
ASSISTANT EDITOR

SMART MERGE DOCUMENTS

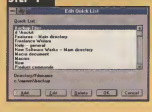
Customize your mail-merge letters with information that's relevant to the recipients—such as their location or type of business. Here's how to make Word for Windows handle such conditional mail merges: First, organize the data to be merged: Create the data file by selecting File, Print Merge, Attach Data File. Next, choose Create Data File and add the field names. Name the data file and save it in an appropriate location. Enter the customized information into the data file's table. Now, insert a conditional statement in your main merge document, position the cursor where you want the statement to appear, and click on the Insert Merge Field button. Choose If... Then from the Word Fields list box and click on OK. Word inserts {IF Exp Op Exp "TextIfTrue"} into your document. Replace the first Exp with a merge field from your data file (click on the Insert Merge Field button), replace Op with an equal sign (=), and replace the second Exp with a value found in the file. Ensure that there's a space before and after the equal

Step by Step: WordPerfect for Windows

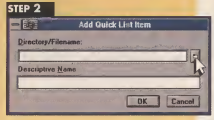
PUT DOCUMENTS ON THE QUICK LIST

The Quick List is handy for switching subdirectories without negotiating the entire directory tree. This undocumented trick also lets you adds file-names to the Quick List for easy retrieval of often-used documents.

Step 1. Call up Quick List.
Choose File, Open. If the Quick List is not already displayed, press Alt-Q or click on the Quick List check box. Then click on Edit Quick List.



Step 2. Add a Quick List item.
Click on Add to open the Add Quick List Item dialog box. If you don't know the full path name and filename of the document you want, click on the file folder icon next to the Directory/Filename text box to browse for it.

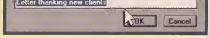


Step 3. Find and add your document.
Find the directory that contains the document you want to add to Quick List. Since the filenames are grayed out, you can't simply click on your document to add it to the Directory Name box. Instead, after the directory name that appears in the Directory Name text box, you have to type a backslash followed by the filename and extension of your document. Then just click on OK.



Step 4. Type a description.
In the Descriptive Name text box, type a more detailed description of the document. Click on OK repeatedly until you're back at the Open File dialog box. To open a document using Quick List, double-click on its Quick List descriptive name.

RON WHITE
EXECUTIVE EDITOR





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SO ADVANCED IT EVEN TURNS ITSELF OFF.

PC MAGAZINE EDITORS' CHOICE
June 30, 1992
FlexScan F550i

Nanao, the technical leader in monitors has done it again. In addition to being the top choice of today's graphics professionals and Windows users, Nanao's award-winning FlexScan F-Series monitors now have a remarkable energy-saving system — Power Save.

Built into Nanao's new 17-inch FlexScan F550iW and 21-inch F760iW, Power Save has been designed to work with all screen saver software, including Windows 3.1 and After Dark. Power Save activates when the blank screen of the screen saver appears, cutting operating power to less than 8% of total consumption. It can also automatically power the monitor down to a stand-by mode when the computer is turned off. These innovations add up to energy savings and longer monitor life, and have placed Nanao at the forefront of the Environmental Protection Agency's EnergyStar Program.

Both the F550iW and F760iW exhibit their superiority in many other ways, as well. Each Invar Shadow Mask CRT has a new anti-reflective coating that eliminates reflection of ambient illumination, without sacrificing the focus level and brightness. Ultra-high resolutions with large screens plus other features make them ideal for CAD/CAM, DTP and Windows applications. On top of that, they can power down. So when you're not working, neither are they.

Nanao FlexScan monitors. Intelligently designed. Incredibly useful. And now, built to help protect our environment by reducing energy consumption.

1993 W 100 WINDOWS MAGAZINE ANNUAL WIN AWARD
FlexScan F550i

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PC World 1/93

The first rule of any presentation is keep it simple.

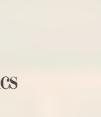
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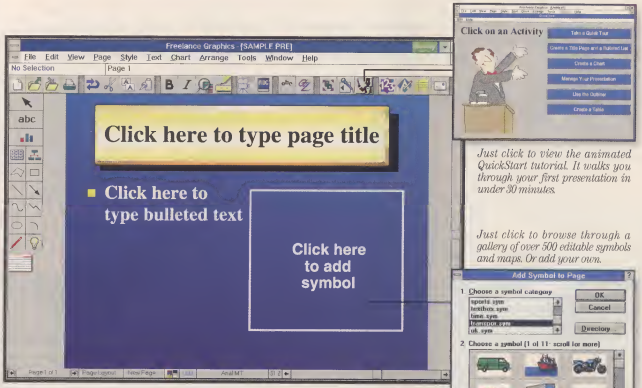
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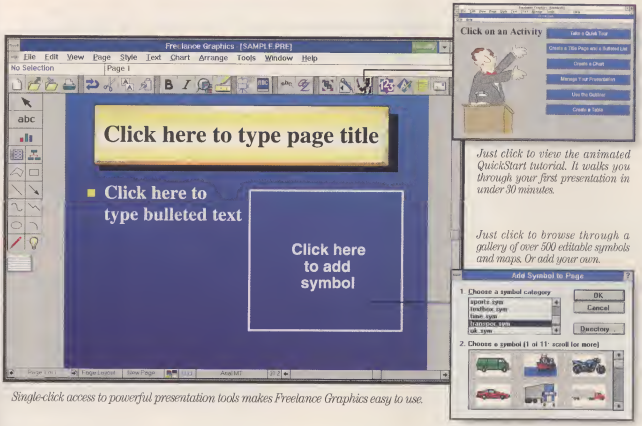
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Lotus Freelance Graphics 2.0

Presentation Graphics for Windows

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sign. Between the quotes, type the text you want to appear when the field contains the value you've specified, such as

```
{IF {MERGEFIELD Territory} = 1 "We
  have been serving Cook County
  for over 10 years."}
```

When you've completed the first conditional statement, create additional ones to insert text when the field contains other values. Simply copy the conditional statement and replace the value and text to insert, making sure there are no spaces or hard returns between IF statements.

For longer phrases or paragraphs in conditional statements, use an INCLUDE field to retrieve the text from a separate file. Format the IF statement as follows:

```
{IF {MERGEFIELD Territory} = 3
 {INCLUDE C:\\WINWORD\\NEWAREA.DOC}}
```

To insert the INCLUDE field, choose Insert, Field, and choose INCLUDE from the Insert Field Type list. Then type the filename, including the full path, in the Field Code box, and choose OK. Enter the filename formats with double backslashes (\\) in field codes instead of single backslashes, which are used to format command switches.

GEORGE BEINHORN
CONTRIBUTING EDITOR

WORDPERFECT FOR WINDOWS

FORCE LINE JUSTIFICATION

Ordinarily, if you use a hard return to end part of a newsletter story that jumps to another page, the last line is left-aligned even if you have full justification turned on for that paragraph. Here's how to avoid that.

Position the cursor at the end of the last line you want on the first page. Click on Layout, Line, Special Codes, Hyphenation Soft Return (HyphSRt), and Insert. Now click on File, Preferences, Environment, turn off Auto Code Placement, and click on OK. Finally, click on Layout, Justification, Full.

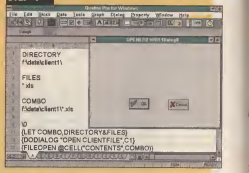
If you use Reveal Codes, you'll see that the codes [HyphSRt] and [DSRt] (discretionary return) have been added to the end of the line, followed by a [Just:Full] code at the beginning

Step by Step: Quattro Pro for Windows

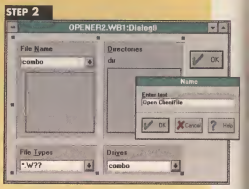
OPEN SPECIFIC FILES FROM YOUR OWN DIALOG BOX

Need to open files from a remote subdirectory for a particular project—maybe with a file extension different from Quattro's? Create an auto-open macro for the project's main workbook that uses a custom dialog box. First, open your project's workbook, then select a macros page.

Step 1. Create the macro.
Enter the macro lines shown in the screen. Then select cell A1 and select Block, Nomes, Labels, Down, and click on OK. Repeat for cells A4, A7, and A10. Then select Tools, UI Builder to produce o reody-to-edit dialog box.



Step 2. Add controls to the dialog box.
Enlorge the dialog box ond drog the two buttons to the right. Then select the SpeedBor's File Control icon, and ploce the object in the diolog box. Then renome the box: Right-click on the title bor, select Nome, enter Open ClientFile, and press Enter.



Step 3. Link the box to the macro.
Select Dialog, Links, and click three times on the Object Link box's Add button. Chonge the buttons on each line to motch those shown here:

```
Row 1:
  ON Init RECEIVE Value FROM
     COMBO Value

Row 2:
  ON Valuechanged SEND Value TO
     COMBO Value

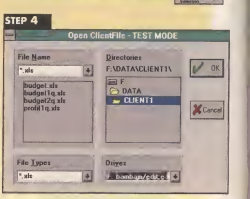
Row 3:
  ON OKExit SEND Value TO COMBO
     Value
```



To moke the <Point> lines reod COMBO, select <Enter> ond type COMBO. For the other buttons, pick the oppropriote options from the pick list. Then click on OK.

Step 4. Combine the elements.
Click on the SpeedBor's lightning-bolt Test button. The words TEST MODE will oppeor in the diolog box's title bor. If the diolog box looks OK, select File Sove. A copy of the diolog box will be stored in the workbook's Grophs poge.

RICARDO DOBSON
LOUISVILLE, KENTUCKY



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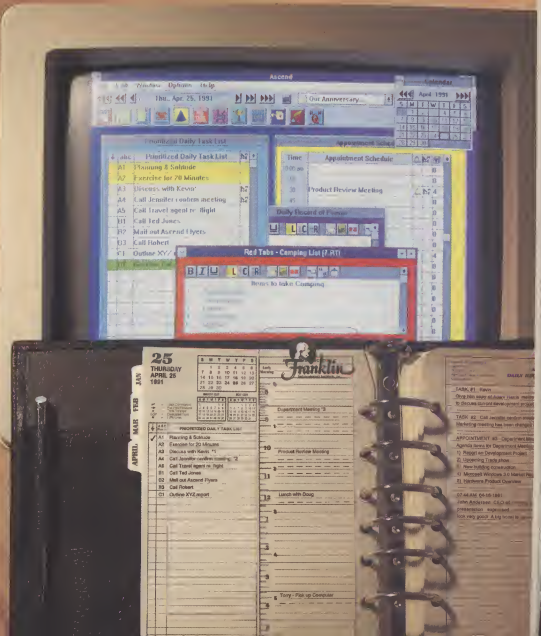
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of the next line. Now select the text just after the [Just:Full] code, cut it, and paste it elsewhere without disturbing the line's justification.

RON WHITE
EXECUTIVE EDITOR

WORDPERFECT

BUILT-IN CALCULATOR SAVES TIME

Don't scribble your calculations on a notepad when you can perform them onscreen with WordPerfect's built-in calculator. To open the calculator, press Alt-F10, type in CALC, and press Enter. Make certain Num Lock is on, and perform your calculations on the numeric keypad. When you're through, press the space bar. The answer will be inserted into your document.

If you use it often, create a macro. Press Ctrl-F10 and press Alt-C. Press Enter to begin recording, then press Alt-F10, type in CALC, press Enter, and press Ctrl-F10 to stop the macro definition. Now just press Alt-C to use your calculator.

DON LI
WASHINGTON, D.C.

AMI PRO 3.0

FASTER SCROLLING AND REDRAW

Speed up screen redraws by hiding pictures. Choose Tools, SmartIcons and in the Available Icons list box, locate the Hide/Show Pictures icon. Drag the icon to the current icon palette, position it, and click on OK.

The icon has two modes: Click on the X icon to hide pictures by replacing each one with a large framed *X*. To display the pictures, click on the icon of the man wearing a hat.

MOIRA MOYNIHAN
TOLEDO, OHIO

ANCHOR CAPTIONS TO GRAPHICS

To keep pictures and their captions together as you edit your Ami Pro documents, put them both in a table. Create a table of two rows by two columns and import the picture into the top right cell. A tiny image will appear. To increase the image's size, expand the cell: Place the insertion point in the top left cell, and choose Text, Font. Under Points, specify a large point size, such as 100, then click on OK. This increases the size of both cells. Position the insertion point in the cell with the picture and choose Frame, Graphics Scaling to size the picture. Or size it by varying the font size in the adjoining cell and the width of the picture cell. Adjust the column width of the left cell to determine text alignment, and type the caption in the cell under the picture.

TECHNICAL SUPPORT GROUP
LOTUS DEVELOPMENT CORP.

QUATTRO PRO FOR WINDOWS

JOIN DATABASE TABLES

Eliminate lengthy analysis of database files and unnecessary data entry. Use Quattro Pro for Windows to join two or more dBASE or Paradox tables in your Quattro Pro spreadsheet.

Invoke the Desktop Database from your spreadsheet by clicking on Data, Desktop Database. Assuming you have two tables that contain identical field names, choose File, New Query, and select the first database file to link. Hold down the Ctrl key, select your second database file, and then choose OK. These actions place two Query forms in the Desktop Database. To link the tables, click on the Join Tables SpeedBar button, and click once in the common field of both database tables. Click the lightning bolt icon to quickly query the databases into a single answer table. To copy the results of your query to the Clipboard, choose Edit, Select All, and press Ctrl-Ins. Return to your Quattro spreadsheet and paste in your collected data.

RICARDO DOBSON
LOUISVILLE, KENTUCKY

MICROSOFT EXCEL

BUILD A NUMBER FORMAT

Don't feel limited by Excel's number formats—create your own with the wildcard character (#). Here's an example that places slashes between the month, day, and year for international formats. Select the area to format, then click Format, Number. Highlight Date, and in the Code box, add this line:

```
##"/"##"/"##
```

Enter any date without the slashes, and Excel then formats that date with slashes. This works for any number format with separators, such as parts numbers and social security numbers.

SHEP HENDERSON
CHARLOTTESVILLE, VIRGINIA

QUICK TABLE CLICK TRICKS

For quick table formatting, place the cursor within a table, hold down Shift and click repeatedly on the AutoFormat icon. Excel applies a different predefined table format with each click.

SHANE DEVENSHIRE
WALNUT CREEK, CALIFORNIA

LOTUS 1-2-3

(NEGATIVE PERCENTAGES)

Standard accounting practice is to put negative figures in parentheses, but 1-2-3's percentage formula uses a minus sign. Here's a formula for rendering negative percentages in parentheses. It assumes that the original data is in the A column and that the formula is in B.

```
@IF(A1>=0,A1,@REPEAT(" ",
  @CELL("WIDTH",B1) -(@LENGTH
  (@MID(@STRING(A1,2),1,10))+5))&"
  ("&@MID(@STRING(A1*100,2),1,10)
  &"%)")
```

This technique works in Releases 2.*x* and 3.*x*, 1-2-3 for Windows, and in Quattro Pro.

SHANE DEVENSHIRE
WALNUT CREEK, CALIFORNIA

MORE MEMORY UNDER WINDOWS

Use 1-2-3 Release 3.4's program information file to run 1-2-3 under Windows, and you'll encounter a memory crunch in no time. Worse yet, editing the EMS and XMS settings in PIF has no effect. The solution? Make PIF start 1-2-3 with a batch file that allocates memory using *123memsize* as a replaceable parameter. Assuming that 1-2-3 is located in *c:\123r34*, enter these lines in a text editor and save them as 123.BAT:

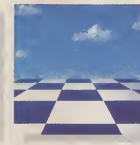
```
SET 123memsize=%1
C:
CD\123R34
123
```

Then, open 123.PIF in PIF Editor, change the Program Filename to 123.PIF, and ensure that the Start-up






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Directory is C:\123R34. In the Optional Parameters box, enter the amount of extended memory to allocate to 1-2-3 (in kilobytes). To allocate 4MB, for example, enter 4096. Finally, set the KB Desired setting for conventional memory to 640.

RICARDO DOBSON
LOUISVILLE, KENTUCKY

PARADOX FOR WINDOWS

SHOW FIELD NAMES

Fields without titles can save much-needed space on your forms—but without titles, they're difficult to identify. To identify them, create ObjectPal code that displays the selected field name in the Status window.

Open the form in design mode, with Advanced menus on. Without selecting any object, right-click on an open area of the form to select it. Press Ctrl–space bar to open the Methods dialog box. Double-click on Status from the Built-in Methods list to open the ObjectPal editor, and enter this code between the method and endmethod statements:

```
var
objectname UIObject
fieldname String
endVar
eventInfo.getTarget(objectname)
if objectname.Class = "Field"
  then fieldname = objectname.Name
eventInfo.setReason(StatusWindow)
eventInfo.setStatusValue(field
  name)
endif
```

Choose Language, Check Syntax to ensure that there are no typos, and close the ObjectPal editor. While in design mode, right-click on each object and make sure that the object name is descriptive—this is the name that will be placed into the Status window. Select Form, Browse to return to the data-entry screen, and click on one of the fields. The field name appears in the Status window.

JOHN TASCHEK
ASSISTANT EDITOR

PARADOX FOR DOS

DRAW LINES WITH EASE

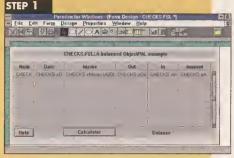
Avoid tedium and errors when you draw boxes and lines in the Paradox 3.5 or 4.0 report generator: Create a

Step by Step: Paradox for Windows

EXECUTE APPLICATIONS FROM A PARADOX FORM

Running a program to check a figure in another application while using a database form is a troublesome task—especially if the other application isn't running. Follow these steps to create a button that launches the Windows Calculator from within a Paradox form.

STEP 1: Design the button.
Open the sample form CHECKS.FSL found in your Paradox examples directory. Press F8 to enter design mode. Click on the button tool, and drog on outline af it anto your form. Size the button os needed ond release the mouse to create o button object that you con ossign ObjectPol code to. Double-click on the LABEL text within the button ond drog your mouse over the text to select it. Hit the Del key, type in CALCULATOR, ond press Enter.



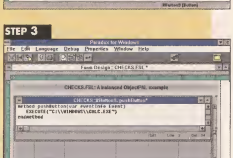
STEP 2: Choose the method.
Click an the new button to select it and press Ctrl–spoce bor to display the Built-in Methods diolog box. Select pushButton from the Methods diolog box to ottoch ObjectPol code that executes when the button is pressed. Click on OK to open the ObjectPol editor.



STEP 3: Add button script to call the application.
Type in the following commond between the method ond endmethod statements, ossuming that WINDOWS is where the colculotor is stored.

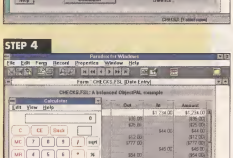
```
EXECUTE("C:\\WINDOWS\\CALC.EXE")
```

Change the path as necessary, but remember to enter double backsloshes when specifying o poth contoined in o string. Press Ctrl-F4 to close the diolog box, ond then select File, Save to save the form.



STEP 4: Use the new button.
Press F8 to view the data, and click on the Calculotor button to run the progrom without leoving your form. Yau con create other buttons for your favorite word processor or text editor. Run them by specifying the poth and executoble nome in ploce of CALC.EXE.

ROBERT BAYLEY
ASSISTANT EDITOR





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script that uses Shift–*function key* combinations to draw lines. Create the following script, or add it to your INIT script so that it runs every time you start Paradox. Choose Scripts, Editor, Write, type a name for your script, and press Enter.

```
SETKEY -84 "│" ;SHIFT-F1, ALT-192
SETKEY -85 "─" ;SHIFT-F2, ALT-196
SETKEY -86 "┘" ;SHIFT-F3, ALT-217
SETKEY -87 "┐" ;SHIFT-F4, ALT-179
SETKEY -88 "┤" ;SHIFT-F5, ALT-191
SETKEY -89 "┴" ;SHIFT-F6, ALT-196
SETKEY -90 "├" ;SHIFT-F7, ALT-218
SETKEY -91 "┬" ;SHIFT-F8, ALT-179
```

To generate the line-draw characters in the script, turn on Num Lock, then hold down Alt as you type the appropriate three-digit number on the numeric keypad. (The text following the semicolon on each line is a comment and won't affect the execution of the script.) When you're done typing, press F2 to save the script and return to the main menu. When you want to design your dialog box, choose Scripts, Play.

ROBERT L. POTTY
LENEXA, KANSAS



FOXPRO FOR WINDOWS

RUN DOS APPS FROM FOXPRO

Don't Alt-Tab from FoxPro to the Windows Main group to run a DOS application. Run it straight from FoxPro's command line. To access the Microsoft System Diagnostics, for example, enter this line in the command window:

```
! c:\windows\MSD
```

You can omit the drive and the directory code if the program's in a directory on your AUTOEXEC.BAT's path. The amount of memory given to this DOS application is determined by its PIF file if it has one, or by FoxPro's default PIF file, FOXRUN.PIF, if it doesn't have one. Modify this PIF file if you run short of resources for more complex programs.

JOHN TASCHEK
ASSISTANT EDITOR

MICROSOFT ACCESS

BOOST ACCESS PERFORMANCE

Fine-tune Access to take advantage of a PC with 8MB of RAM or more to boost database performance. Access's default settings are for systems with 4MB of RAM. If you've got at least 8MB, increasing the Buffers setting will speed calculations and table and query operations. Open MSACCESS.INI—found in the Access directory—in an ASCII text editor and add this line to the [ISAM] portion of the file:

```
MaxBufferSize=4096
```

Save the file, and restart Access. This increases eightfold the amount of memory Access dedicates for storage of temporary data. Modify the buffer as needed, but don't specify more than 4096KB on an 8MB system, or you might slow down the application.

ALAN WALKER
LOS ALTOS, CALIFORNIA

"It's like having a personal teacher."

—Hugh Anderson, *The Gazette*, reviewing *PC Learning Labs Teaches DOS 5*

PC Learning Labs book/disk tools from Ziff-Davis Press. They're the next best thing to having a computer expert by your side. Letting PC Learning Labs guide you patiently through the ins and outs of a new program makes learning a snap. Impartial computer industry commentators agree:

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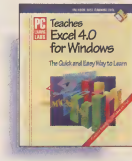
—*Computer Book Review*, reviewing *PC Learning Labs Teaches Excel 3.0.*



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POWERPOINT

COLORIZE EMBEDDED CHARTS

Embedding a chart from Excel in a PowerPoint presentation may produce a dull gray graphic instead of a brightly colored one. When Excel acts as an object linking and embedding source, it checks the client application's printer driver for color support, and sends color information based on what it finds.

One imperfect but quick fix is to change PowerPoint's target printer temporarily to a color printer. Choose File, Printer Setup, and pick the HP DeskJet 500c or Genigraphics, and click OK. Then embed the Excel chart and return your printer setup to normal. The problem is that after you edit the object with a black-and-white printer setup, it turns gray again. Another quick but unsatisfactory fix is to cut and paste a chart, but this produces a static picture that won't be updated as the source data changes.

The best fix is to use Excel's custom colors before the embedding process. In Excel, double-click on a colored element of the chart to open the Patterns dialog box, and select Area, Custom. Repeat this process for each colored element in the chart. The colors remain when you embed the chart in PowerPoint, even if it's edited.

MATTHEW LAKE
ASSOCIATE EDITOR

LOTUS ORGANIZER

ORGANIZE YOUR CALLS

Track your calls with a communication log that links directly to your address book. Select Options, Customize, and click on Add to add a new section, based on Notepad. Name the section Phonelog, change the section position and tab color to suit your tastes, and click on OK to display the new section.

Add a Notepad page in Phonelog for each person or company that you want to track your communications with. Select the anchor tool, position it over the new entry, and click to set the anchor. Use the Address section to find the name and address of the company you want to link to. Click on the name to set the link—a chain link appears on the upper right of the screen.

Now when you take calls from a company, click on its name in Phonelog to jump to the Address book. You can log notes about telephone conversations in Phonelog, along with the date and time. Each page of the Phonelog is a complete record of your contacts with a particular person or company.

HILLARY RETTIG
FOREST HILLS, NEW YORK

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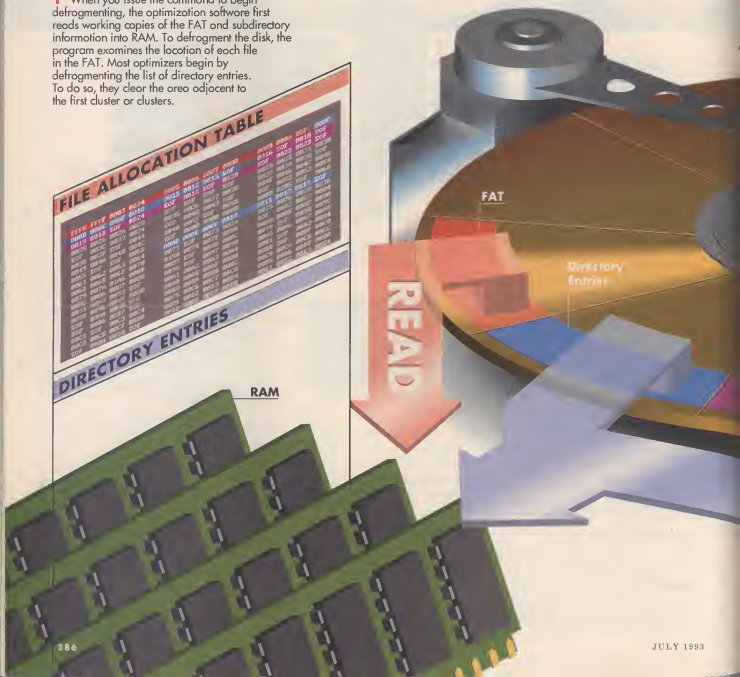
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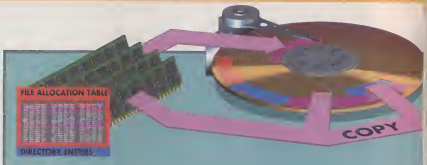
WHY DOS FRAGMENTS FILES AND HOW AN OPTIMIZER SPEEDS UP YOUR DISK.

BY DYLAN TWENEY • ILLUSTRATION BY TIMOTHY EDWARD DOWNS

To write a file to disk, DOS uses the disk's file allocation table (FAT) to find the first unused cluster and starts writing there. If the file is too big to fit, DOS writes leftover data in the next free cluster it finds. DOS updates the FAT to mark the location and sequence of the file's clusters and then creates a directory entry for the file that indicates its beginning cluster. To read a file from disk, DOS uses the file's directory entry to locate its first cluster and uses the FAT to find the rest.

1 When you issue the command to begin defragmenting, the optimization software first reads working copies of the FAT and subdirectory information into RAM. To defragment the disk, the program examines the location of each file in the FAT. Most optimizers begin by defragmenting the list of directory entries. To do so, they clear the area adjacent to the first cluster or clusters.





2 To clear space for the directory entries at the beginning of the disk, the optimization software copies files from the beginning of the disk into RAM, then writes them into unused clusters elsewhere. At this stage, the files exist at two places on the hard disk.



3 The optimizer then updates the FAT and directory entry to point to the file's new location. Finally, it marks the FAT entries for the file's original clusters as unused, in effect deleting the files and freeing the space up for other files. Leaving this step until the last moment ensures that power outages or system crashes during optimization won't cause any data loss.

4 Once space has been cleared at the beginning of the disk, the software moves the remainder of the disk's subdirectory entries there, followed by any files that you've specified for placement at the beginning of the disk. With the directory entries in place, the optimization software repeats the process in order to defragment all the files on the disk.

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Circle 265 on reader service card.

TIPS AND TECHNIQUES TO BRING OUT THE BEST PERFORMANCE IN YOUR PC AND PERIPHERALS

MONITORS/PRINTERS

OPTIMAL OUTPUT

When scaling a bit-mapped graphic, don't leave the quality of printed output to chance—calculate the resizing factor that ensures the best output from your system. To do this, you need to know the resolution of your printer and monitor in dots per inch. You already know the printer's resolution, but to calculate the monitor's, you must know the width in inches of the onscreen image. Measure the image of an application's screen (maximized if it's in Windows), and divide the horizontal resolution in pixels (640 for regular VGA, and 800, 1,024, or 1,280 for high-resolution drivers) by the number. If your screen is 12 inches wide and runs applications in 800-by-600 mode, its resolution is 800 divided by 12, or 66.66 dots per inch.

Next, calculate the screen's resolution as a percentage of your printer's—take the screen's resolution in dots per inch, divide it by the printer resolution, then multiply the total by 100 using this formula:

$$\frac{\text{MONITOR RESOLUTION}}{\text{PRINTER RESOLUTION}} \times 100$$

The result for a 400-dpi printer is (66.66/400)x100, or just under 17 percent. Whenever you need to resize a bit-mapped graphic, use this result as your system's scaling factor: To achieve the best output from this monitor and printer combination, resize the graphic to any multiple of 17 percent. Instead of halving the size, scale it to 51 or 68 percent. Instead of doubling its size, increase it to 187 or 204 percent.

MATTHEW LAKE
ASSOCIATE EDITOR

PRINTERS

FAST FINDER FOR PRINTER PORTS

You plug a printer into a PC you've never used before—and nothing works. First, ascertain which port the printer is attached to. It's probably one of the first two LPT ports. If the system uses 25-pin serial ports like some old systems do, you may even be using a COM port. Use this batch file to find out the port allocation for sure:

```
@ECHO OFF
ECHO This is LPT1 > LPT1
ECHO This is LPT2 > LPT2
ECHO This is LPT3 > LPT3
ECHO This is LPT4 > LPT4
ECHO This is COM1 > COM1
ECHO This is COM2 > COM2
ECHO This is COM1 > COM1
```

This file is simple but handy—it

/// Hardware Checklist ///////

A FIELD GUIDE TO PORTABLE PRINTING

When you're traveling on business, chances are you'll need to print a document. Be prepared for the scant appartunities you'll have to get hard copy. Even if you're lucky enough to have a portable printer, you'll find that its limited battery life requires mare careful management than even a notebaok PC's.



Save up your print jobs . . . Ta reduce printing time (and thus save your portable printer's battery), print in batches. The quickest and easiest way to da this is ta preprint your documents: In Windows' Cantral Panel under Printers, click an Cannect, and select FILE as your Part. (In nan-Windaws software, select the Print ta File aptian). Whenever you select the Print cammand, you'll be prampted far a file-name. Always print your files ta the same directary (ar ta a flappy disk), and use the same extension to make finding and outputting the files easier.



. . . and print them together. When you want hard copy, use the DOS COPY command ta send the files to the printer part. If it's LPT1 and you've used the PRN extension far your print files, use the cammand COPY *.PRN LPT1 ta send them aver. Windaws users must copy files one by ane from File Manager: Highlight the filename, press F8, and enter the printer part. (Ignare the ayerwrite warning and click an OK ta send the file.)



Pick the fastest emulation. Raad-warthy printers mast cammanly emulate bath Epsan and IBM dat matrix printers. Although these drivers print text at abaut the same speed, the Epsan made will usually praduce graphics pages (including gridlines in spreadsheets) substantially quicker. Da a quick time test before yau pack up, and change the printer's emulatian before yau hit the raad (this usually requires flipping a dip switch).



Quick port test. You have the chance ta print fram sameane's PC at a remate site, but you don't knaw which part the printer's attached ta. If it's a netwarked PC, use NetWare's CAPTURE SHOW cammand far a listing af part assignments ar check the Windaws Cantral Panel's Printers selectian. Far a standalane PC, use the batch file shawn in "Fast Finder for Printer Parts" at left.



Carry diverse drivers. Ta ensure that you can preprint files far any printer, carry several printer drivers with yau. By bringing alang the mast camman—Epsan and IBM dat matrix drivers, an HP LaserJet Series II driver, and a PastScript driver—yau shauld be able ta print fram any applicatian an your laptap ar an a barrawed affice camputer. If yau use Windaws, laad the drivers before yau hit the raad. That way, the right driver is just a couple af clicks away.

PEGGY WALLACE
SAN FRANCISCO, CALIFORNIA

Get the new skills you need for a high-paying career in computer programming!

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code, run, debug, and document programs in QBasic, C, and Visual Basic. Best of all, since Visual Basic is specifically designed for creating Windows applications, you learn to generate fully functioning Windows programs, complete with text boxes, command buttons, and other sophisticated graphical interface elements.

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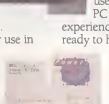
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echoes a port identification to each of the likely printer ports, which should then output a page that tells you which port the printer's attached to. In some cases, you'll need to press the printer's Form Feed button to eject the message.

M.J. JOHNSON
SAN FRANCISCO, CALIFORNIA

CLEAN CORONA WIRES

You've recently replaced your toner cartridge, and now vertical stripes of toner are darkening your printouts. The first thing to do is inspect the surface of your toner cartridge's drum (quickly and out of direct light, since this reduces the light sensitivity of the drum). If the surface is not scratched but is thickly coated with toner, the problem is that its electric charge is not being dissipated. The problem lies with either the transfer corona wire or the primary corona wire, one or both of which will also be caked with toner and unable to transfer its charge.

other form of hardware—yet almost all of us need them. Most regular power strips provide little or no protection against transient voltage surges common to many power grids. If your neighborhood is subject to variable power levels or electrical storms, get the extra protection of a real surge protection strip.

To ensure that a strip has adequate transient voltage surge suppression, look for a UL 1449 sticker. A plain UL sticker doesn't guarantee power protection; even the UL 1449 rating has a variety of classes depending on the volts it can withstand. For this class of device, UL 1449 at 330 volts is as much protection as you can expect.

Most surge protectors use metal oxide varistors to soak up the extra transient surges the power lines throw at your PC. But MOVs deteriorate over time, leaving many people with a false sense of security and no indication that their power protection is gone. Look for power protection

the external system battery or pull the CMOS chip from its socket. Leave the battery or chip disconnected for half an hour to drain the contents of the CMOS. If the BIOS is located on flash EPROMs, however, even this technique won't work.

If your data is very sensitive, CMOS-level of protection is the best to adopt—but you'll also want watertight password protection in a screen blanker for when you're away from your desk, and in your network connections so that snoops can't access data through the back door. If your current BIOS doesn't support such security measures, upgrade to one that does.

BURT DOBSON
SAN DIEGO, CALIFORNIA

CURE PARITY ERRORS

Getting intermittent parity errors that crash your system? If the usual tricks don't work (see "Cure Your Defective Memory," Hardware Hints, April, page 282, for SIMM-swapping tips), try this: Since timing errors

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echoes a port identification to each of the likely printer ports, which should then output a page that tells you which port the printer's attached to. In some cases, you'll need to press the printer's Form Feed button to eject the message.

M.J. JOHNSON
SAN FRANCISCO, CALIFORNIA

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The transfer corona wire is part of the printer itself; the primary corona is in the toner cartridge. To clean the transfer corona, you should first turn off the printer and open its cover. With a cotton swab dipped in isopropyl alcohol (but not dripping), clean the area around the wire. For Hewlett-Packard LaserJets, this includes the orange pads at each end of the wire, the area underneath the plastic lip, and the area along the back of the casing.

The primary corona wire is not as likely to need cleaning. If the problem continues and you have a LaserJet, scrape this wire off with the small felt-tipped brush that's housed in your printer. But proceed with caution—the primary corona wire is more fragile, and if you break it off, you'll need to replace the cartridge.

CHRIS WARD
ATLANTA, GEORGIA

POWER PROTECTION

SHOP SMART FOR POWER STRIPS

Less is said about how to buy surge protectors than about almost any other form of hardware—yet almost all of us need them. Most regular power strips provide little or no protection against transient voltage surges common to many power grids. If your neighborhood is subject to variable power levels or electrical storms, get the extra protection of a real surge protection strip.

To ensure that a strip has adequate transient voltage surge suppression, look for a UL 1449 sticker. A plain UL sticker doesn't guarantee power protection; even the UL 1449 rating has a variety of classes depending on the volts it can withstand. For this class of device, UL 1449 at 330 volts is as much protection as you can expect.

Most surge protectors use metal oxide varistors to soak up the extra transient surges the power lines throw at your PC. But MOVs deteriorate over time, leaving many people with a false sense of security and no indication that their power protection is gone. Look for power protection strips with a self-test feature. This may be an OK light, or a warning light that flashes when the MOVs have been knocked out.

LARRY DANFORTH
LIVERMORE, CALIFORNIA

SYSTEMS

CMOS SECURITY MEASURES

For an ironclad security system, don't tinker with AUTOEXEC.BAT and disk drive locks—check to see whether your BIOS supports password protection. CMOS-based security is often the last measure most people consider, but it's the most secure available, and many BIOS's provide it. To see whether your BIOS is among them—and to activate password protection if it is—call up your CMOS setup.

Before bringing CMOS password protection into play, consider the dangers. If you forget your password or need to access a former co-worker's PC, it's extremely difficult to get to the data. There are only two sure ways of getting back into a PC that has password-protection on the motherboard (other than by using the password), and that's to disconnect the external system battery or pull the CMOS chip from its socket. Leave the battery or chip disconnected for half an hour to drain the contents of the CMOS. If the BIOS is located on flash EPROMs, however, even this technique won't work.

If your data is very sensitive, CMOS-level of protection is the best to adopt—but you'll also want watertight password protection in a screen blanker for when you're away from your desk, and in your network connections so that snoops can't access data through the back door. If your current BIOS doesn't support such security measures, upgrade to one that does.

BURT DOBSON
SAN DIEGO, CALIFORNIA

CURE PARITY ERRORS

Getting intermittent parity errors that crash your system? If the usual tricks don't work (see "Cure Your Defective Memory," Hardware Hints, April, page 282, for SIMM-swapping tips), try this: Since timing errors often cause parity problems with fast machines (40MHz and higher), set up wait states in your BIOS. The technique for doing this depends on your BIOS version and maker, but it's usually in the Advanced Setup section under one of three possible headings: Hidden Refresh Rate, DRAM Timing, or Wait State. To set up a wait state, change the setting from 0 to 1 (or from Fast to Slow if that's how your BIOS refers to it).

If this doesn't help, and if you're using 2- and 8-chip SIMMs, try substituting more expensive 8- or 9-chip modules. These typically don't run as hot in a fast system as the cheaper modules—and keeping your chips cool can reduce parity errors.

SALLY NEUMAN
SYSOP, PC/CONTACT

Have you mastered your modem or monitor? Are you proficient with PCs and printers? Know how to get the most from your hardware? Share your secrets! If we publish your hint, we'll pay you $50. Send your tips, along with your name, address, and daytime phone number, to Hardware Hints, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404.

AUTHORITATIVE ANSWERS TO YOUR MOST PRESSING PC QUESTIONS. BY DALE LEWALLEN AND JEFF PROSISE

Copy Specific Files

I want to back up certain files I work on daily to a floppy disk so that I can work on them away from the office. Is there an easy way to copy only selected files (for example, files with .DOC or .XLS extensions) that were created or modified on the current date?

DEAN BRADY
SAN MATEO, CALIFORNIA

If you work with few enough files each day that they will fit on one floppy disk, then you're in luck. First, create a batch file consisting of these two lines:

```
@ECHO OFF
SET DATE=%4
```

Save it as CURRENT.BAT in the batch file directory listed in your PATH statement. (Don't use another name for this file; the word CURRENT is important, for reasons you'll understand later.) Next, create this batch file and save it under the name 2FLOPPY.BAT (or another name if you prefer):

```
@ECHO OFF
ECHO.|DATE>C:\TEMPBAT.BAT
CALL C:\TEMPBAT.BAT
DEL C:\TEMPBAT.BAT
XCOPY \DOC\*.DOC A: /M /D:%DATE%
XCOPY \XLS\*.XLS A: /M /D:%DATE%
SET DATE=
```

This batch file assumes that DOC files are located in the subdirectory \DOC and that XLS files are stored in \XLS. If these path names differ on your PC (they probably will), modify the XCOPY commands accordingly. When you run 2FLOPPY.BAT, it will automatically copy all the DOC and XLS files created or modified on the specified date from their directories to the disk in drive A:.

Here's how these batch files work: The XCOPY commands in 2FLOPPY.BAT do the real work. The /M switch tells XCOPY to copy only the files whose archive attributes are set (files that have been created or modified since the last backup). The /D:%DATE% switch restricts XCOPY to files stamped with a date that is equal to or later than the date specified in the environment variable DATE.

The trick lies in setting DATE to the current date. To pull it off, 2FLOPPY.BAT executes a DATE command and redirects output to a temporary file named TEMPBAT.BAT in the root directory of drive C:. TEMPBAT.BAT contains a single line that looks something like this:

```
Current date is Mon 07-05-1993
```

Here's where CURRENT.BAT comes in. When 2FLOPPY.BAT executes TEMPBAT.BAT with a CALL command, CURRENT.BAT is executed. It creates an environment variable named DATE and sets it equal to the fourth command line parameter passed to it: 07-05-1993 in our example. As a result, the DATE environment variable is set equal to the current date. Before terminating, 2FLOPPY.BAT cleans up after itself by deleting TEMPBAT.BAT and the DATE environment variable. Note that these batch files require DOS Version 3.3 or higher because earlier versions don't support the CALL command.

Skip Parts of AUTOEXEC.BAT

I currently have my PC set up to load Windows each time I boot. I use Windows about 90 percent of the time, but during the other 10 percent I have to sit back while Windows starts and then exit back to the command prompt. This takes a while because I have Windows automatically start three applications from the Startup group. Is there a simple way to configure

Help About...

WINDOWS RESOURCE MANAGEMENT

BY CHECKING THE SHAREWARE SYSTEM INFO MENU OF THE SHAREWARE PROGRAM PLUG-IN FOR PROGRAM MANAGER, I DISCOVERED THAT 634K OF WORD FOR WINDOWS' 877K RESOURCES ARE MARKED "DISCARDABLE." CAN I ADJUST THE FIGURE SO THAT LESS OF THE PROGRAM CAN BE DISCARDED?

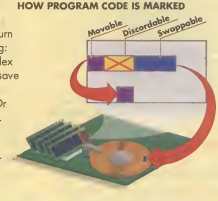
GEORGE PLATT
JACKSON HOLE, WYOMING

You can't redesignate the discardable partians af any Windaws application. Windaws application developers mark each segment of cade in ane of three ways—"discardable," "swappable," or "mavable"—so that Windaws can manage its resources effectively. When you load several Windaws apps, the aperating system keeps as much af your inactive applications in memary as passible. However, if Windaws needs mare raam, it may discard same of the inactive applicatian (simply write aver it) ar stare parts af it in a disk-based swap file. Cade marked "movable" may be relacated ta ather memary addresses, but it stays in memary at all times.

If avaiding data loss is your priarity, facus an your wark habits. Don't turn your PC aff when Windows is running: Its resaurce management is taa camplex to make this safe far your data. And save aften: Assign the File Save cammand ta a single key and use it regularly. Or set your pragram's Autasave functian.

If you do lase data because af a system crash, try trawling your hard disk for TMP files with file sizes larger than 0 bytes and apening them. It's a lang shat, but it just might wark.

HOW PROGRAM CODE IS MARKED



Our Competitors Are So Confident Of Their Products, They Guarantee Them To Last A Third As Long As Ours.



There's a common misconception today that computers are all alike. That they're made from the same components. That a box is a box is a box.

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That, in the end, COMPAQ computers are designed to help you get more done with fewer problems.



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Circle 255 on reader service card.

my system so that I can boot straight to the DOS prompt when I wish to?

LARRY L. HALL
BOURBON, INDIANA

There are several ways. If you've upgraded to DOS 6.0, modify your CONFIG.SYS file to present you with a menu each time you start up. If you haven't upgraded, try the killer multiple-configuration utility Bootcon from Modular Software Systems, which lets you maintain a hundred different configurations and pick one from a menu. This much power and the $79 price may be overkill, but if you maintain different hardware configurations, it's a must. (For more information, call Modular Software Systems at 800-438-3980 or 206-631-5781.)

To maintain just a few configurations, use this command script to create SHIFTKEY.COM, a utility that will prevent Windows (or any other program you choose) from loading if you hold down the Shift key during the execution of AUTOEXEC.BAT. In any text editor that creates plain ASCII files, copy the following commands exactly as they are printed:

```
N SHIFTKEY.COM
E 0100 B4 02 CD 16 24 03 B4 4C
E 0108 CD 21
RCX
A
W
Q
```

Save the file in a utilities directory on your DOS path under the name SHIFTKEY.SCR. Then type

```
DEBUG < SHIFTKEY.COM
```

This creates a utility named SHIFTKEY.COM that returns an ERRORLEVEL code equal to 1 or higher if one or both Shift keys are pressed, 0 if neither Shift key is held down. At the end of your AUTOEXEC.BAT file, add the following commands to prevent Windows from starting if a Shift key is depressed:

```
SHIFTKEY
IF ERRORLEVEL 1 GOTO NOWINDOWS
WIN
:NOWINDOWS
```

When you don't want to start Windows, hold down one of the Shift keys while your AUTOEXEC.BAT file is processed. Otherwise, leave the Shift keys alone. It's that simple.

If you prefer to use another key, modify SHIFTKEY.COM to check the Ctrl or Alt key instead of the Shift keys. To check the Ctrl key, change the 03 in the line that begins with E 0100 to 04. For the Alt key, change 03 to 08.

To get a copy of SHFKEY.ZIP (both the executable program and the DEBUG script) without typing in the code, either download it from data library 3 (Utilities/Misc.) of PC/Contact, *PC/Computing*'s online service, or order this month's Editor's Picks disk from Public Brand Software. See page 268 for more information.

Ways to Speed Up Windows

None of the articles I have read about optimizing Windows for speed has mentioned the potential benefits of a math coprocessor. Until my budget can stretch to some of the more expensive hardware upgrades, would a math coprocessor be a wise investment?

ED ACHESON
DECATUR, ILLINOIS

A math coprocessor speeds up certain applications, but it does nothing for the Windows operating system. If you use Windows spreadsheets (such as Excel) that were written to take advantage of math coprocessors, you'll see the benefit in a 387 chip when the spreadsheet uses floating-point math. But since the Windows operating system relies almost exclusively on integer—rather than floating-point—math calculations, such coprocessors won't help Windows.

If you're interested in speeding up Windows, your best investment is more RAM for your PC. More RAM means less swapping to disk, and

Challenge

I WAS TRYING TO PRINT A DOCUMENT FROM MICROSOFT EXCEL THE OTHER DAY AND RAN INTO A PROBLEM. MY PC IS CONNECTED TO AN APPLE LASERWRITER IINT VIA FARALLON'S PHONENET LAN. WITH THAT CONFIGURATION, IT TOOK ME MORE THAN 7 MINUTES PER PAGE TO PRINT A SIMPLE SPREADSHEET. WHAT CAN I DO TO SPEED UP MY PRINTING?

JOHN MOYES
GREENFIELD, MASSACHUSETTS

Nabady ever said that Windaws was a speedster, especially when it comes ta printing. Can you suggest ways ta make printing faster, nat only far Excel but far all Windaws applicatians? If sa, drap a letter ta us marked "July Challenge."

MARCH CHALLENGE SOLVED

In our March Challenge, we asked yau ta solve a reader's prablem with WordPerfect's graphic baxes feature. Kenneth Bartlett wanted ta know if it was passible ta wrap text araund bath the left and right sides of a graphic box in a single calumn.

Several WardPerfectianists sent in their techniques. The process is cumbersome but it can be done in ane af three ways.

Janet Ratzlaff af Wheat Ridge, Calarada, was the first ta respand with a warkable salutian. Ms. Ratzlaff suggested placing the graphic in the calumn and then using the [AdvTaPas:x.xx"] cade ta mave parts af the text beyand the graphic. An alternative is ta use tabs ta mave partians af a line beyand the embedded graphic. A third salutian is ta incarparate a three-calumn table within the calumn. Place the graphic in the middle calumn and then type yaur text into the calumns on either side af the graphic. The advantage ta this third method is that you can right-justify text an bath sides of the graphic. It's nat as easy as in PageMaker, but WordPerfect can da the jab.

Blow the doors off Windows.



ISBN: 1-56276-084-X
Price: $27.95

Get maximum performance out of Windows with *2001 Windows Tips.* No one knows Microsoft Windows like Mike Edelhart and the editors of *PC/Computing.* Now this all-new book reveals thousands of their favorite productivity-enhancing techniques to optimize Windows 3.1 (and 3.0) and introduce you to the kind of power computing they enjoy at *PC/Computing* every day.

There's no other Windows resource like *2001 Windows Tips.* Masterminded and written by Edelhart, an executive vice-president of Ziff-Davis Publishing Company and *PC/Computing*'s former publisher and editor-in-chief, *2001 Windows Tips* showcases the experience of the most respected Windows authorities in one easy-access volume.

Many of these tips and secrets have never been seen in print before. They include speed tricks and little-known commands that improve Windows startup, printing, and file management. There are also plenty of novel strategies to unleash the hidden functionality of the Windows Accessories and your applications. And the reference-like format of *2001 Windows Tips* makes it a cinch to find valuable help on any topic.

Get *2001 Windows Tips* by Mike Edelhart and blow the doors off Microsoft Windows.

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Available at your nearest SOFTWARE etc store.

HOW TO JOIN PC/CONTACT

For current CompuServe subscribers, just type GO PCCONTACT to access the forum. Cost is based on CIS's fee of $12.80 per hour for 1,200/2,400 bps and $22.80 per hour for 9,600 bps. There is an additional $2.50 ZiffNet membership charge per month for all users, which includes a number of free services. For complete information, type GO ZNT:RATES when online.

For new subscribers, follow these steps:

1. Set the following parameters within your communications program: 7 data bits, even parity, 1 stop bit, and full duplex.
2. Call CompuServe's toll-Free Customer Assistance Line at (800) 848-8990 (United States) or (800) 635-6225 (Canada); this call is quick and free. From other countries, dial CompuServe direct at (614) 457-8650. A voice-response system will ask you if you want a local-access number. Then you'll be asked to enter your phone number and the speed at which you want to access the system. CompuServe reads back the local number you'll use to access the service.

   Or call CompuServe with your modem. Set up your modem and telecommunications package using 7 data bits, even parity, 1 stop bit, and full duplex, and call (800) 346-3247. When the modem connects, press Enter. When you see the HOST NAME prompt, type in PHONES and then hit Enter. Then just follow the onscreen menus and note the access phone number for your area.
3. Dial the local-access number with a modem. When you connect to the network, press Ctrl-C to get its attention.
4. At the HOST NAME prompt, type CIS (which is the acronym of the CompuServe Information Service).
5. At the USER ID prompt, enter 177000,5300.
6. At the PASSWORD prompt, enter PC/CONTACT.
7. At the ENTER AGREEMENT NUMBER prompt, type 210DPCC1.
8. If you have trouble, call the Customer Assistance Line at (800) 848-8990. After you follow the above procedures, the CIS system will provide you with your own user ID—called a PPN—and a temporary password. You can then log on and begin to explore PC/Contact. In about two weeks, you'll receive a letter from CIS confirming your PPN and providing you with a new password. You should then change your password by typing GO PASSWORD at any CIS prompt.

TOP PICKS ON DISK

You can easily get all the public-domain utilities or shareware covered in this month's issue by calling the disk vendor Public Brand Software at (800) 426-3475 or (317) 856-7571. Ask for this month's Editors' Picks from *PC/Computing*. They're available for $5 or less per disk (most disks have several utilities and programs on them), plus $5 for shipping and handling. Visa and MasterCard are accepted.

therefore increased Windows performance. More RAM also gives you the option of creating a larger disk cache with SmartDrive, which speeds the process of reading and writing data to disk. In mail-order ads, RAM prices are around $50 to $80 per megabyte—the per megabyte price is about what you'd pay for a math coprocessor, in fact.

Another way to speed Windows up is to install an accelerated graphics card. These take charge of time-consuming graphics manipulations such as BitBlts (moving blocks of pixels around on the screen) and line draws, thus freeing up the CPU to deal with Windows. Inexpensive accelerator cards can improve Windows performance by a factor of two or more. They cost from $100 to $250. For raw speed at a rock-bottom price, try out the $99 D24 BitBlaster Plus (write Micron Computer at 915 E. Karcher Rd., Nampa, ID 83687 or call 800-438-3343 or 208-465-3434).

Inaccurate Adapter Readings

What does the line labeled "Adapter RAM/ROM" in the output from DOS 6.0's MEM command refer to? It reads 0K on my PC, but I know for a fact that I have at least 32K of adapter ROM on a Super VGA card and 32K of adapter RAM on a network card.

MARGIE SHEA
TYLER, TEXAS

Until late in the DOS 6.0 beta cycle, "Adapter RAM/ROM" signified the amount of address space between 640K and 1MB that had not been converted to upper-memory-block RAM. If MEM reported 128K of upper memory, it in turn reported 256K of adapter RAM/ROM.

By the time DOS 6.0 hit the stores, the figure had nothing to do with adapter RAM and ROM anymore. Now, when MEM determines how much RAM your PC contains and arrives at an answer that isn't an exact multiple of 1MB, it rounds up the answer to the nearest megabyte and reports the difference on the Adapter RAM/ROM line. If Adapter RAM/ROM is greater than 384K, MEM gives up and simply reports 0K.

In short, don't attach any significance to the number. In most cases, it simply reflects the amount of RAM hidden from DOS—for example, extended memory devoted to ROM shadowing.

SETVER and MSCDEX

Your recommendation to search through CompuServe for the newest MSCDEX to end DOS version conflicts (Q&A, December 1992, page 374) was unnecessarily complex and costly. If the version of MSCDEX the reader wrote about is dated 6/1/90 or later, he can eliminate the "Incorrect DOS version" message by loading DOS 5.0's SETVER.EXE device driver in AUTOEXEC.BAT and adding the following command:

```
SETVER C:\path\MSCDEX.EXE 4.01
```

Unlike your suggestion, this solution is quick and free.

DON CUFFEL
PLEASANT HILL, CALIFORNIA

You're quite right; this is a quick and easy to way to force MSCDEX into line, provided that the version of MSCDEX you're using is of recent enough vintage. The only drawback to your method is that SETVER.EXE claims about 1K of RAM. That's not a severe penalty, but you can avoid it by upgrading to a more recent version of MSCDEX.

If you use DOS 6.0, throw both solutions out the window. MSCDEX became a part of the DOS package in Version 6.0. Now when you upgrade DOS, you get an updated copy of MSCDEX at no extra charge.

Do you need help using your computer? Q&A provides practical advice on PC problems. Questions are selected on the basis of broadest interest and may be edited for clarity and length. Sorry, but we cannot answer questions individually. Send your question, along with any screen printouts or other details that could help solve it, to Q&A, Help, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404. You can also reach us via CompuServe, on *PC/Computing*'s PC/Contact online service. Send your comments or questions to 76000,21.

PC Computing

COMING SOON

WordPerfect 6.0

Wait no more: WordPerfect 6.0 for DOS is here. The question is, should you invest in what might be one of the last significant DOS programs, or is it time to switch to a Windows word processor? We'll tell you all that's new to this upgrade—and compare four leading word processors to help you find out which program is best for you.

Network Laser Face-Off

Don't let your bustling business be slowed down by a print server. Laser printers that connect directly to networks provide the print quality, speed, and functions that business users need, and they enable you to bypass the more expensive print-server route. We compare Compaq's Pagemarq 20, Hewlett-Packard's LaserJet 4Si MX, and Lexmark's LaserPrinter 4039-16L head to head and consider less expensive options that meet specialized needs.

Buying Direct

Does the idea of buying direct daunt you? It shouldn't! Buying direct is both convenient and safe. In a three-part supplement, we'll tell you how to get the best deal on hardware, software, and peripherals through the mail and show you how to compare and evaluate vendors and products so you can make a wise purchase.

Plus . . . the newest "green" PCs, tips for trimming the fat from your Windows subdirectories, and undocumented DOS 6.0.



Circle 182 on reader service card.

READ ALL ABOUT IT EVEN BEFORE IT'S IN PRINT.

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ZiffNET

ALL ABOUT COMPUTING...ON-LINE

CompuServe and ZiffNet members type GO ZNT:INDUSTRY ©1992 Ziff Communications.

EXPERT TIPS AND TECHNIQUES FOR TAPPING INTO YOUR NETWORK'S HIDDEN STRENGTHS

NETWARE ADMINISTRATION

GET ANNOUNCEMENT OUT EARLY

Don't rely on e-mail to warn network users that you're shutting down the file server for maintenance. To eliminate the flood of complaints to your office, post important messages so that all users see them at log-in time. One simple command—DISPLAY—entered into the main log-in script displays any text message during the log-in process.

First, create an ASCII text message announcing the time the network is next scheduled to be shut down for maintenance. Include the time that network services will be restored and the name of an emergency contact. Use hyphens, asterisks, or underlines for emphasis, but don't add any extended ASCII formatting characters—NetWare can't display them with the DISPLAY command. Save the file in the SYS:PUBLIC directory as MESSAGE.TXT.

Next, enter SYSCON at any prompt while logged in, and select Supervisor Options, System Login Script. Add these lines to the end of the script:

```
DISPLAY Z:\PUBLIC\MESSAGE.TXT
PAUSE
```

Press Esc, save the changes, and press Alt-F10 to exit SYSCON. NetWare displays the message at each workstation as the last part of the log-in process.

When you restore the network, create a new message announcing any changes network clients should be aware of, and save it as RESTORE.TXT in SYS:PUBLIC. Follow the steps to edit the system log-in script, and replace the filename MESSAGE.TXT with the new filename. Save both files for future use so that you can edit the messages instead of recreating them. Precede the DISPLAY command with REM to disable the message while keeping it ready for the next time.

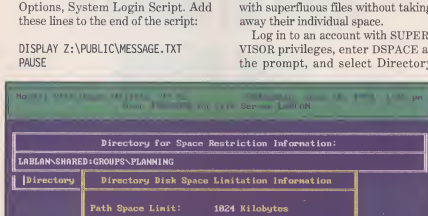
JOHN TASCHEK
ASSISTANT EDITOR

CURB FILE PROLIFERATION

Running low on server storage space despite strict allocations to individual users? Then limit space given to shared directories. This prevents clients from filling a shared directory with superfluous files without taking away their individual space.

Log in to an account with SUPERVISOR privileges, enter DSPACE at the prompt, and select Directory Restrictions. Press Ins to open the NetWare file manager, select the directory that you want to modify, and press Enter. Press Esc to leave the file manager, and Enter to open the Directory Restrictions menu. Type Y under Limit Disk Space, and under Set Directory Space Limit, type the maximum disk space to be allotted (in K). Press the Esc key to save your changes and Alt-F10 to leave the program. Your changes take effect immediately.

JOHN TASCHEK
ASSISTANT EDITOR



Administrators can control the buildup of superfluous files in shared directories by setting a cap on disk space allocated to directories with NetWare's DSPACE utility.

REDUCE INACTIVE CONNECTIONS

You're getting complaints because no one can log in to the network—all the connections are occupied. If your network has more workstations than session licenses, set NetWare's WATCHDOG parameter to minimize the number of inactive, open connections.

These inactive connections occur when NetWare clients reboot or shut off their systems while still logged in. WATCHDOG polls workstations for inactive connections—if there's no reply within a default time of 5 minutes, NetWare sends the workstation a series of data packets every minute for 10 minutes. If there's still no reply, NetWare drops the connection. If 15 minutes of polling time is too much, set WATCHDOG to its minimum values.

Next, type LOAD INSTALL at the file-server console, select System Options, Edit AUTOEXEC.NCF, and before any line that loads a system menu, type

```
SET NUMBER OF WATCHDOG PACKETS=5
SET DELAY BEFORE FIRST WATCHDOG
 PACKET = 15.7 SECONDS
SET DELAY BETWEEN WATCHDOG PACKETS
 = 1 SECOND
```

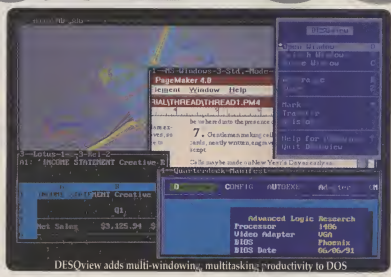
The first line sets the number of WATCHDOG packets that NetWare sends before it disconnects an inactive connection. Values range from 5 to 100. The next two lines determine how long NetWare waits before sending the first packet (values range from 15.7 seconds to 20 minutes and 52.3 seconds) and the time between subsequent packets (values range

The death Has been greatly exaggerated of DOS

DOS is still the preferred operating system on over 80% of the PCs in Fortune 1,000 companies, according to recent studies.

Bring Windowing Advantages to DOS.

Many Fortune 1,000 companies are using DESQview™ as the best solution for keeping the dependability and familiarity of DOS programs and adding multitasking, windowing productivity. DESQview users give up nothing—since it actually runs MS Windows better should users wish to run Windows programs.



DESQview adds multi-windowing, multitasking, productivity to DOS

As you may know, DESQview 386 has been around for years, evolving into a highly efficient multitasking, windowing environment that extends the power of DOS, giving you increased productivity while conserving precious memory and disk space. In fact, the vast majority of 386 and 486 PCs need no additional memory or disk space to run DESQview.

DESQview 386 gives you pre-emptive multitasking like OS/2, but with ½th of the disk space and ⅓th of the memory requirements. It gives you windowing like MS Windows, but with greater speed and efficiency and fewer 'crashes.' And DESQview lets you use a mouse or stick to the keyboard.

You Create the Standards; We Follow.

We've never been confused about our role. We believe software companies exist to make your job easier and your working day more productive. When publishers step out of that mold and begin to tell you what hardware you need and that you should throw out somebody else's perfectly good software—well, they simply are not operating in your best interest.

Software publishers don't create standards. You do. And whatever standard you choose, we support it.

If you like a program that only runs in MS Windows, like Wordperfect for Windows, DESQview 386 supports your choice. If you prefer a spreadsheet that runs in DOS, Lotus 1-2-3 Release 3, for example, we support that too. In fact, DESQview 386 lets you run your favorite DOS and Windows programs side-by-side.

Have Your Cake and Eat It, Too.

DESQview 386 comes with QEMM-386, the number one memory management utility, and Quarterdeck Manifest, the award-winning memory analysis and monitoring program. Between them, they assure you every last 'K' of memory is put to use.* In many cases, QEMM can mean the difference between running the TSRs you want and not having enough memory.

And DESQview is an open doorway to the future, too. Our next step up, DESQview/X, opens your PC to a network full of possibilities, including graphic workstation standards—X Window System software—all while retaining the compatibility of DESQview.

If you're as committed to DOS as we are, and feeling left out by the so-called industry leaders, take heart. There's no reason to leave DOS. If more productivity is what you need, we can provide it.

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* DESQview makes multitasking and windowing available to users of 286-class machines with similar memory efficiencies through QEMM-50/60 for IBM™ PS/® 50 and 60 users and QRAM for other 286 users.

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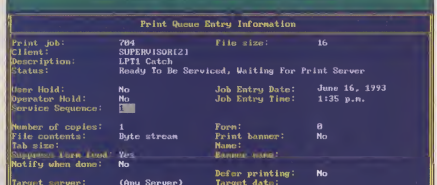
from 1 second to 10 minutes and 26.2 seconds).

WATCHDOG also helps find faulty network cards or cabling problems. Enter this command at the file server console prompt or add it to AUTOEXEC.NCF to monitor stations logged out of the network by WATCHDOG:

```
SET CONSOLE DISPLAY WATCHDOG
  LOGOUTS=ON
```

This displays a console message each time WATCHDOG clears a connection, which helps isolate the stations with connection problems.

WILLIAM BEEM
ORLANDO, FLORIDA



Cut to the front of the print queue when you need that report in your hands right away. All you have to do is fire up PCONSOLE and set the Service Sequence setting to 1.

NETWARE PRINTING

CONTROL YOUR SHARED PRINTER

Got an urgent print job that can't be delayed? If your PC is connected directly to a network printer, temporarily reserve the printer for your personal use with the PSC command.

First, find the name assigned to the print server and the number of the printer. If you're a system administrator, you'll know the printer's name. If you don't remember the printer number, select Print Server, choose the appropriate print server, and press Enter. Select Printer Configuration, locate the printer name on the list, and note the number that follows.

If you don't have supervisor rights, load PCONSOLE, select Print Queue Information, and choose your print queue from the list. Press Enter, select Queue Servers, and press Enter again for a list of print servers. Since there's usually only one printer attached to your workstation, write down its name. You'll still need the number, which only the administrator can access. However, NetWare sequentially numbers up to 16 printers per print server starting at 0. Try 0 if there's a single printer connected to your workstation.

Next, enter the PSC command with this syntax to turn the network printer into a private printer:

```
PSC PS=[print server name]
  P=[printer number] PRI
```

For example, to convert your first printer attached to a print server named HPLASER_SHARE, enter the following command:

```
PSC PS=HPLASER_SHARE P=0 PRI
```

The PRI flag indicates that you're setting the printer up to be private. These settings remain in effect until you change them or log out, so remember to enable network access after your job is completed. Enter this command to convert it back into a shared network printer.

```
PSC PS=HPLASER_SHARE P=0 SH
```

Better yet, create a batch file called URGENT.BAT run an application, then restore the printer when you exit the program.

```
PSC PS=HPLASER_SHARE P=0 PRI
Y:\WP51\WP.EXE
PSC PS=HPLASER_SHARE P=0 SH
```

Note: This tip works only on printers connected with NetWare's server-based RPRINTER program.

SCOTT WILMONT
900 SUPPORT

PRIORITIZE PRINT JOBS

Don't get stuck at the end of the print queue if you've got an emergency print job that can't wait. Change the sequence of your job from last place to first, and avoid the delay.

First, go to the print server and call up PCONSOLE. Select Print Queue Information, highlight the print queue of your choice, and press Enter. Select Current Print Job Entries, press Enter, and highlight the job you want to print first. Cursor down to Service Sequence and enter 1 to make it the first job in the queue. Press Esc and Alt-F10 to exit PCONSOLE. Your job should be the next one out of the queue.

Note: You can sequence jobs only from a system logged in with Queue Operator privileges.

JOHN TASCHEK
ASSISTANT EDITOR

Do you get the best out of your network without calling tech support? Share your secrets. If we publish your tip, we'll send you $50. Send your tips, along with your name, address, and daytime phone number to Networking Smarter, *PC/Computing*, 950 Tower Lane, 20th Floor, Foster City, CA 94404.

PC/Computing (ISSN 0899-1847) is published monthly by Ziff-Davis Publishing Company, a division of Ziff Communications Company, One Park Ave., New York, NY 10016. Second Class postage paid at New York, NY 10016 and at additional mailing offices. Postmaster: Send address changes to *PC/Computing*, P.O. Box 58229, Boulder, CO 80321-8229. The Canadian GST registration number is R123669673.

Now Windows is as easy to use as DOS.

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But if you're among the many who've traded the frustration of the C: prompt for the graphical confusion of Program Manager, relax.

You're about to discover what half a million delighted DOS® and network users already know.

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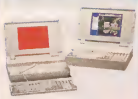
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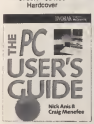
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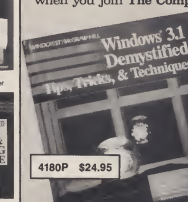


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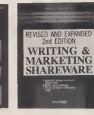
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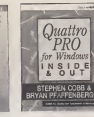
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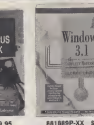
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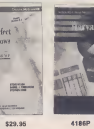


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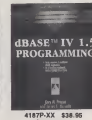
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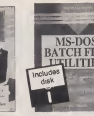
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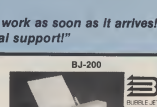
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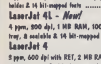
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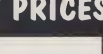
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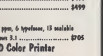
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	8Meg Kit	5005607-003	399.00
	16Meg Kit	5005607-004	799.00
	32Meg Kit	5005607-005	1599.00
Premium 386/25, 16 SX	1Meg (4)	5007018-001	59.00
Premium 386/33	1Meg (4)	5007018-902	59.00
Premium II	1Meg	5007080-003	WPS 69.00
386SX/20, 486-SX, 25E, 33	1Meg (4)	5007080-902	WPS 69.00
Premium Tower, 386/33TE,	4Meg (4)	5007080-901	WPS 159.00
486-DX/TE, 486/33TE			
Quad Memory Board	128Meg	5003619-001	Call

ZENITH MEMORY MODULES

MODEL	ABT. UPGRADES	AST PART #	PRICE
ZBM433, 25, 20, 13S	1Meg	ZA3M1MS	79.00
ZBM433, 25, 20, 33, 486/25E	4Meg	ZA3M04MS	149.00
Z386SX	2Meg	ZA2M02MS	4 - 9.95 / modules 99.00

MAGNAVOX

386SX/20-16, 386SX/E-20, 486SX-20 & 386-33

all are PPM 30MHz

2MEG = 50.00

4MEG = 149.00 8MEG = 309.00

MEMORY BOARDS

IBM Compatibles & PS/2'S

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• Expanded memory for XT • Lim • 4.0 compat. • 2Megs uses 256k's-100

0-K – **$24.00** 1Meg **$175.00** 2Meg – **$210.00**

IBM P/S2 32BIT EXPANSION BD.

2-32MEG, EMS-Expand. Memory Bd. for PS/2, 70, 80, 95 • Lim 4.0

0Meg 4Meg 8Meg 16Meg 32Meg 64Meg

$139.00 $254.00 $328.00 $477.00 $795.00 $1,499.00

PS/2 MCA 0-8MEG EXPANSION BD.

0-8Meg, Extended 4/370/ Expanded Memory for all IBM PS/2 Models 50, 50Z, 60, 65SX, 65SX, 70, 80, A, 90, 95 • Lim 4.0 compat.

0K – $110.00 2Meg – **140.00** 4Meg – **250.00** 8Meg – **$400.00**

IBM PS/2 SIMM MODULES

IBM PART NO.	WORKS WITH MODEL NO.	PRICE
30F3304 (1Meg)	70-386, 25-286, 80 MTHR BD	39.00
30F3305 (2Meg)	70-386, 25-286, 80 MTHR BD	79.00
30F3306 (4Meg)	70-386	159.00
30G0300 (1Meg)	Notepad 300L	39.00
64G0375 (1Meg)	90	59.00
64G0377 (2Meg)	90-XP, 95	119.00
64S1090 (4Meg)	80-421, A-81, 82-A21, 80-111, 80-311	199.00
64S1091 (8Meg)	95XP 486, 95XP, SCE, Model-351, P70	549.00
64S0606 (2Meg)	70-081, B61, 121, 302, 55SX, 65SX, P-70	77.00
64S0608 (2Meg)	55LS, 65LS, Station 100 & 130, 350LX, 35LS, 45SX	64.00
	70-A21, A-61, B-21, B-61, 55SX, 35LS, 45SX	64.00
76H8955 (1Mb)	55	35.00
76H8956 (2Mb)	55SX, 45SX, 55SX, 65SX, 55SLS, 65LS	149.00
76H8957 (4Mb)	55SX, 55LS, 65SX, 45SX, 55SX, 35LS	149.00
70G7035 (512K)	P/S1-286	64.00
92F6605 (2Meg)	P/S1, P/S1-088/061-2121	64.00
92F6604 (4Meg)	P/S1 & P/S1/3823E, Model-2121	144.00
64S0602 (2Meg)	57, 57SX, 90, 95, P-75, P-75 XP	99.00
	Value Point 7? 486DX2, 486SX, BF, SLS	64.00
64S0120 (4Meg)	57SX, 90, 95, P-75, 57SLC, 56, 56SX	149.00
	P/S?, 3868X, Model-2123, 2133, 2153, 2155,	
	Value Point 7? 486SX, 486SX, 486DX, SLS	64.00
64S5120 (8Meg)	35SX, 40SX	299.00
64S5130 (8Meg)	56, 57, 57SX, 90, 95, P-75, 57SLC	299.00
	Value Point 7?, 486DX2, 486SX, SLS	
79H7999 (2Meg)	P/S1-2121, P/S1 Num Pro	99.00
79H1000 (4Meg)	L440, 425SX, PS Note	159.00
79H1001 (8Meg)	L440, 425SX, PS Note	299.00
07G1021 (1Meg)	N51 (x1)	59.00
07G1027 (4Meg)	N51 (x4)	169.00
07G1828 (4Meg)	N51 (x4)	169.00
07G1423 (4Meg)	CL57,SX Color LapTp, Thinkpad 700, 700C	199.00
07G1424 (8Meg)	CL57,SX Color LapTp, Thinkpad 700, 700C	339.00
92F6804 (2Meg)	N45SL	99.00

COMPAQ MEMORY MODULES

MODEL	ABT. UPGRADED	COMPAQ PART #	PRICE
DeskPro 386/33, 386/33L	1Meg Module	115144-001	99.00
486/25, 486/33L	2Meg Module	115651-001	189.00
486/33L, System Pro	4Meg Module	115558-001	359.00
DeskPro 386/33L, 486/33L	Sys Bd	116569-001	289.00
DeskPro 386/25, 386/33	1Meg Module	113131-001	99.00
	4Meg Module	113132-001	174.00
DeskPro 386S-16Mhz	1Meg Module	113263-001	112.00
	4Meg Exp Bd	113634-001	219.00
	4Meg Module	113645-001	75.00
DeskPro 386/20E	1Meg Module	112304-001	174.00
DeskPro 386/25E	1Meg Exp Bd	113264-001	112.00
DeskPro 386/25E	4Meg Exp Bd	113645-001	219.00
	4Meg Module	113131-001	74.00
	1Meg Module	113132-001	174.00
DeskPro 2/80h, 386h	1Meg Module	118868-961	50.00
386/20E, 386/20M, 486/20M,	4Meg Module	118869-001	99.00
486/25, 25M, 486/33M	4Meg Module	118893-001	149.00
Prolin 486/2	8Meg Module	118877-001	339.00
M Server Exp Bd	1-64Meg		274.00
DeskPro 386/16	1Meg Kit	109071-001	99.00
	4Meg Kit	109072-001	399.00
	1-2Meg Kit	109073-001	199.00
	4-8Meg Kit	109074-001	599.00
DeskPro 286	512K Kit	113012-001	59.00
Prolinea 386	1Meg	141738-001	99.00
	4Meg	141747-001	299.00
Prolinea 466	1Meg	141682-001	99.00
	2Meg	141683-001	98.00
	4Meg	141684-001	159.00
	8Meg	141585-001	319.00

COMPAQ LAPTOPS & NOTEBOOKS

LTE 286	2Meg Bd	117700 -002	99.00
LTE 286	4Meg Module	117701-001	219.00
LTE 386/20 SX, 25C	4Meg Module	131125-002	179.00
LTE 386/20 SX, 25C	8Meg Module	131126-002	319.00
LTE Lt/386,20, 25C	4Meg Module	131127-002	219.00
LTE Lt/386,20, 25C	8Meg Module	131128-002	399.00
LTE Lt/386 4/25C	4Meg Module	131129-002	219.00
LTE Lt/386 4/25C	8Meg Module	131130-002	399.00
LTE Lt/386 4/25C	4Meg Module	142337-002	179.00
LTE Lt/386 4/25C	8Meg Module	142338-002	329.00
LTE Lt/386 4/25C	4Meg Module	142339-002	179.00
LTE Lt/386 4/25C	8Meg Module	142340-002	329.00
LTE Lt/386 4/25C	4Meg Module	115237-001	179.00
LTE Lt/386 4/25C	8Meg Module	115238-001	329.00
LTE Lt/386 4/25C	4Meg Module	118304-001	99.00
LTE Lt/386 4/25C	8Meg Module	118305-001	199.00
Contura 320, 325	2Meg	139497-001	99.00
	4Meg	139498-001	179.00
	8Meg	139499-001	359.00
Contura 4/25, 4/25C, 4/25CX	4Meg		Call

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MODEL	PRICE	MODEL	PRICE
S-RAM Cards 1MEG	295.00	Flash Memory	Call
S-RAM Cards 2MEG	295.00	OTP	Call
Psion Modem™ (HAYES compat.)	249.00	Ethernet	Call
FaxModem/Data MasterCard 9600/2400	279.00	Token Ring	Call
Optical Mouse Card	69.00	SCSI Emulation Adaptors	Call

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T2000/T3000SX	2Meg	PC15-PA0017U	75.00
T2000SX/T3100SX/T1000LE	4Meg	PC-PA0314U	149.00
T2000SX/T3100SX	2Meg	PC14-PA0116U	289.00
T2000SX/T3100SX/T1000, 1850, C	2Meg	PC-PA0050U	75.00
T2000SX/T3100SX/T1000, 1850, C	4Meg	PC-PA0051U	149.00
T2000SX/T3100SX/T1000, 1850, C	8Meg	PC-PA0052U	299.00
T4400SX, SXC T4400	2Meg	PC-PA0304U	164.00
T4400SX, SXC T4400	4Meg	PC-PA0305U	299.00
T4400SX, SXC T4400	8Meg	PC-PA0306U	599.00
T4400SX, SXC T4400	N/A	2596U	2596.00
T4500, T4500C	2Meg	PC-PA0310U	164.00
T4500, T4500C	4Meg	PC-PA0312U	349.00
T4500, T4500C	16Meg/30Meg	N/A / N/A	799.00/2799
T3300SL	4Meg	PC-PA0307U	159.00
T3300SL	8Meg	PC-PA0308U	299.00
T3300SL	N/A	3809U	389.00
T3100SX	2Meg	PC-PA0309U	164.00
T3100SX	4Meg	PC-PA0309U	299.00
T3100SX	8Meg	PC-PA0309U	599.00
T3100SX	2Meg	PC16-PA0310U	164.00
T3100SX	4Meg	PC16-PA0311U	164.00
T3200SX	2Meg	PC13-PA0307U	85.00
T3200SX	4Meg	PC13-PA0308U	164.00
T3200SX	8Meg	PC13-PA0309U	354.00
T3200SX	2Meg	PC19-PA0316U	84.00
T3200SX	4Meg	PC19-PA0317U	164.00
T5200/T6300	2Meg	PC-PA0301U	89.00
T5200/T6300	4Meg	PC-PA0302U	164.00
T5200/T6300	8Meg	PC-PA0303U	299.00

NOTEBOOK, LAPTOP MEMORY

ALR Venturo	4Meg	100814-083	224.00
ALR Venturo (Flash) Exec	4Meg		299.00
AST Ascentia 900N	2Meg		99.00
AST Power Exec 4/25C, 4/25CL, 4/25XL	4Meg		199.00
AST Power Exec 4/25C, 4/25CL, 4/25XL	8Meg		399.00
AST Power Exec 4/25C	16Meg		799.00
AST Power Exec 4/25C	32Meg		1599.00
AT&T Safari NX20VD	2Meg	PC7-131951	150.00
AT&T Safari NX20VD	4Meg	24852-131951	299.00
Bondwell B-316, 316V	2Meg		99.00
Bondwell B316N, SX	2Meg		99.00
Epson NB3SL, NB3SX	1Meg	310-3204	119.00
Epson NB3SL, NB3SX	2Meg	310-3205	219.00
Epson NB3SL, NB3SX	4Meg	310-3206	419.00
Epson NB3SL, NB3SX	8Meg	A808781	799.00
			Call
Everex Tempo LX, LX20	2Meg	PCA 00301-0001	89.00
Everex Tempo LX, LX20	4Meg	PMM PMM-A-0004	179.00
Gateway 2000 Handbook	4Meg	5386-4M	199.00
Leading Edge DLT 386SX			Call
NEC Ultralite 386	1Meg, 4Meg	3123-6104-001	99.00/199.00
NEC 3170	2Meg	3123-6104-1001	299.00
NEC 3170	4Meg		399.00
NEC 3170	2Meg	3123-6104-2001	299.00
NEC Prospeed 286, 386SX-16	1Meg		99.00
NEC Prospeed 286, 386SX-16	2Meg		199.00
NEC Prospeed 386	1Meg		129.00
NEC Prospeed 386	2Meg		229.00
NEC Prospeed 386SX-20	2Meg	PC43-3A	219.00
NEC Prospeed 386SX-20	4Meg	PC43-3B	419.00
NEC Ultralite 20, 20E, 25C	2Meg	BP-410-6006	Call
NEC Ultralite 20, 20E, 25C	4Meg	BP-410-6007	Call
NEC Ultralite 20, 20E, 25C	8Meg	BP-410-6008	Call
NEC Ultralite 4/25, 4/25C	2Meg	PC40-3A	219.00
NEC Ultralite 4/25, 4/25C	4Meg	PC40-3B	419.00
Packard Bell 286SX, 386	2Meg	286, 386SX	89.00/139.00
Packard Bell 4/25C, 4/25CX, 4/33	4Meg	PC40-3B, PC40-3C	419.00
Sharp PC-6000	2Meg	MBC-MM6M2	99.00
Sharp 6781, 6871, 6785	2Meg/4Meg		109.00/179.00
Tandon PC Portable	2Meg		99.00
Tandon PC Board, Castaworld	2Meg, 4Meg	256695-001	89.00, 469.00
Texas Instrument	2Meg	2548202-0001	99.00
Texas Instrument TravelMate	2Meg	2566996-1	99.00
TI 4000	4Meg		199.00, 399.00
Vermeer 486DX, DX	4Meg/8Meg		199.00/399.00
Zeos 386SX Notebook	2Meg		89.00
Zenith Master 286SX		ZA-300-1	89.00
Zenith Master 386SX, 386SX	2Meg	ZA-300-2	89.00
Zenith Master 386SX, 386SX	4Meg	ZA-300-4	179.00
Zenith Master 386SX, 386SX	8Meg	ZA-300-8	359.00
SE Ultra	2Meg	ZA-180-02	89.00
SE Ultra	4Meg	ZA-180-04	179.00
Zenith Data Sys 325L, LC	2Meg	ZA7P0-A1	139.00/409.00

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AMOUNT UPGRADED IN BK	256K	1	2	3	4	5	6	7	8	16	32
Canon LBP-4	----	----	----	----	----	----	----	----	----	----	----
Compaq Personal	----	----	----	----	----	----	----	----	----	----	----
Deskjet 500C Accel Laser	----	99	199	----	----	----	----	----	----	----	----
Epson EPL-4000	----	----	----	149	----	----	----	----	----	----	----
Epson 8000	----	99	199	----	249	----	----	----	----	----	----
HP IIP	----	----	----	----	----	215	----	----	----	----	----
HP IID, IIP, IIP, IIP PI	----	----	----	----	----	----	----	----	----	----	----
HP IIP	----	49	----	99	----	149	----	199	----	----	----
HP IIP	----	49	80	----	----	149	----	309	----	----	----
HP Deskjet 500, 500C, 550	----	----	----	----	----	149	----	309	----	----	----
HP LaserJet III, IIIP	----	----	----	----	----	----	----	----	745	----	----
HP LaserJet 4/4Si, 4Si MX	----	----	----	----	----	256	----	----	----	----	----
HP LaserJet 4000	----	----	----	----	----	----	----	----	----	----	----
HP LaserJet 4M	----	----	----	----	----	----	----	----	Call	Call	Call
HP LaserJet 4P	----	----	----	----	----	----	----	----	----	----	----
HP LaserJet 4Si	----	----	----	----	----	----	----	----	----	----	----
Jet 400	----	99	----	----	----	----	----	----	----	----	----
Jet 500	----	99	----	----	----	----	----	----	----	----	----
Packard Bell PB 9500	----	----	----	----	----	----	----	----	----	----	----
Panasonic 4420	----	----	----	112	----	179	----	----	----	----	----
Panasonic 4450	----	----	----	112	----	179	----	----	----	----	----
Panasonic 4455	----	----	----	119	----	189	----	----	----	----	----
Panasonic 4450	----	----	----	----	----	----	----	----	----	----	----
QMS 410	----	112	159	----	249	----	----	----	----	----	----
QMS 815	----	112	159	----	----	----	----	----	----	----	----
Ricoh LP	----	----	----	----	----	----	----	----	----	----	----
Ricoh PC Printer 4	----	99	----	199	----	----	----	----	----	----	----
TI OLYSPLY+/OLS	----	49	----	99	----	----	----	----	----	----	----

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Void after October 31, 1993

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Please answer questions below:

1. **Where do you use your computer?** (Check one only)
   A ☐ Home B ☐ Business C ☐ Both
2. **What kinds of computers do you use?** (Check all that apply)
   D ☐ IBM/Compatible Laptop E ☐ IBM/Compatible Desktop F ☐ MAC
3. **Do you plan to buy any of the hardware or software mentioned below in the next three months?** (Check all that apply)

HARDWARE

G ☐ PC
H ☐ MAC
I ☐ Laptop
J ☐ Printer
K ☐ Monitor
L ☐ Disk/Tape Back-up
M ☐ Add-in Board
N ☐ Modem
O ☐ Input Device
P ☐ Local Area Network

SOFTWARE

Q ☐ Accounting
R ☐ Spreadsheet
S ☐ Personal Finance
T ☐ Desktop Publishing
U ☐ Word Processor
V ☐ Database Manager
W ☐ Graphics
X ☐ Utility
Y ☐ Communications
Z ☐ Windows/Multi-tasking
1 ☐ Programming Language/ Compiler
2 ☐ Integrated/Multifunction
3. ☐ CAD

4. **From which of the following sources do you purchase personal computer products?** (Check all that apply)
   4 ☐ Specialty Computer Retail Stores 6 ☐ Direct from Manufacturers
   5 ☐ Mail Order Firms 7 ☐ Other

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   D. ☐ IBM/Compatible Laptop E. ☐ IBM/Compatible Desktop F. ☐ MAC

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   H. ☐ MAC
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   J. ☐ Printer
   K. ☐ Monitor
   L. ☐ Disk/Tape Back-up
   M. ☐ Add-in Board
   N. ☐ Modem
   O. ☐ Input Device
   P. ☐ Local Area Network

   SOFTWARE
   Q. ☐ Accounting
   R. ☐ Spreadsheet
   S. ☐ Personal Finance
   T. ☐ Desktop Publishing
   U. ☐ Word Processor
   V. ☐ Database Manager
   W. ☐ Graphics
   X. ☐ Utility
   Y. ☐ Communications
   Z. ☐ Windows/Multi-tasking
   1. ☐ Programming Language/Compiler
   2. ☐ Integrated/Multifunction
   3. ☐ CAD

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   4. ☐ Specialty Computer Retail Stores
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   6. ☐ Direct from Manufacturers
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WD-AC2250	Western Digital	245MB	15MS	319.00
MX2425A	Maxtor	345MB	14MS	349.00
LXT340A	Maxtor	340MB	13MS	519.00
WD-AC2340	Western Digital	340MB	13MS	519.00
LXT535A	Maxtor	535MB	13MS	639.00

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MXT213S	Maxtor	213MB	15MS	429.00
LXT340S	Maxtor	340MB	13MS	599.00
LXT540S	Maxtor	540MB	12MS	999.00
MK4368FB (SCSI-2 FAST)	Toshiba	327MB	11.5MS	999.00
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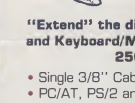
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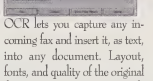
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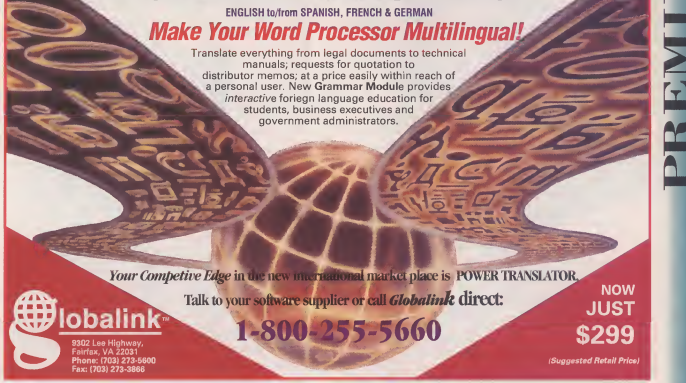
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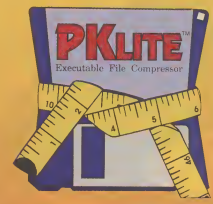
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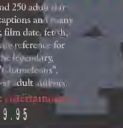
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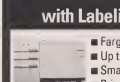
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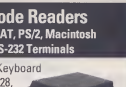
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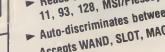
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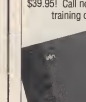
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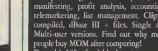
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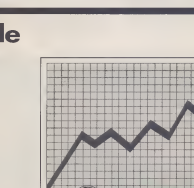
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No computers on planes!? The Feds want you to believe it's for safety.

A DC-10 FLYING into Kennedy Airport suddenly flew off course and almost crashed because a passenger's compact disc player interfered with the plane's control system. The incident may cause airlines to limit the electronic gadgetry passengers can bring on board.

—*Time*, February 22, 1993

WHAT IS THE SCARY part of this news item? Is it "almost crashed"? Are we worried about a DC-10 full of innocent people going down like a flaming cattle car? In a word, no. Do we really care that a "compact disc player interfered with the plane's control system"? Nope. You know goddamn well what the scary part is: "may cause airlines to limit the electronic gadgetry." Oh, man. We can't allow this to happen. We can't.

Are our laptops "gadgetry"? Cellular phones are "gadgetry," but they don't work at cruising altitude anyway. We can't use AM/FM radios and radio-controlled gadgets. (I never even thought of using a radio-controlled toy on an airplane, but now that they say I can't, I'm guessing it's fun.) Sure, they're going to allow pacemakers—that's because I don't have one yet. But what about computers? Well, they're thinking about it.

If I were stark-raving bonkers like Oliver Stone, I'd be thinking that the FAA is doing this to get Penn Jillette. They've been mad at me since I wrote a column about airport security. I didn't like us wasting our time turning on our computers at the metal detectors to prove nothing. So I suggested that we all create AUTOEXEC.BATs to print to screen:

```
ARMING...
ARMED
17 seconds to detonation
Counting...
```

Someone *claiming* to be from the FAA called the magazine and threatened the receptionist. The cheeses freaked a little. I wasn't worried (I have nerves of steel, and Ziff-Davis is more visible to the Feds and has deeper pockets for civil litigation). I felt the First Amendment was on my side. (I know Howard Stern, but now little Ms. Tipper knows someone in the White House personally—who am I kidding?) The "FAA" shut up when *PC/Computing* promised never to put "terrorist information" on the back page again. (The guy who gave his word moved up the corporate ladder.)

If I were Ollie, I'd know the Feds killed a good-looking president just so little Mr. Stone would have to go to Vietnam. So why wouldn't they ban laptops on planes just to hobble some back-page guy?

My good buddies at the FAA claim that pilots tell them that Nintendos and CD players (blaring Judas Priest, no doubt—let's get those boys back in court) throw the circuitry that picks up radio signals from the very high frequency omni-directional radio range (VOR) network out of whack. They say it would never have hurt a good old airplane, but the new ones are more sensitive. It wouldn't cross their minds to design airplanes that can't be sabotaged by Super Mario Brothers. Hell, how about a faraday cage where the smoking section used to be? ("Aft faraday is OCCUPIED?") No way—they want to ban computers.

Well, their vile conspiracy will work. I write most of these columns on airplanes, and if they stop me from doing that, I won't be able to get the back page written. It'll be fine for you—columnists who can mention *Uma Thurman* and *computer* in 650 words are a dime a dozen. But please, while you're enjoying the new back page, remember that I'm watching the edited version of *Honeymoon in Vegas*...again. ◤

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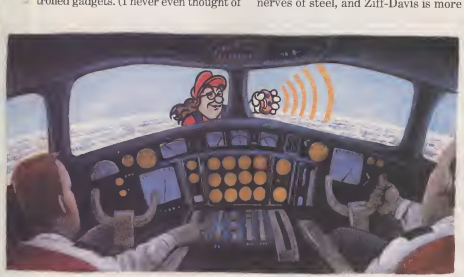


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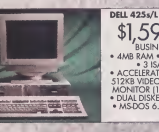
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